FOOD MANUFACTURE

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FOOD MANUFACTURE

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Facing first page of Editorial

FOOD MANUFACTURE

Vol. XV, No. 9 September 2, 1940

Size and Shape of Loaves

As has been anticipated for some time, drastic reduction in the sizes and shapes of loaves has become law, and the Bread (Restriction of Sales) Order, 1940, came into force a week ago to-day. "Except under and in accordance with the terms of a licence granted by or on behalf of the Minister of Food, no person shall sell or expose for sale (*a*) any loaf of bread other than a Scottish loaf except in the following shapes: A one-piece tin loaf (not more than one cut); not more than one shape of a one-piece oven bottom loaf (not more than two cuts); a one-piece sandwich loaf; and the shape known in Scotland as a one-piece batch loaf or one-piece pan loaf. (*b*) Any loaf of bread (other than Vienna bread or a Scottish loaf) unless its weight be one pound or an even number of pounds; (*c*) any roll of bread exceeding two ounces in weight; and (*d*) any Vienna bread except in a loaf weighing eight ounces." "Scottish loaf" means a tin loaf of bread baked in Scotland of a weight of one pound and twelve ounces. The order does not apply to the sale of any loaf or roll of bread containing dried or other fruit.

Canned Flour

Flour dried under a high vacuum to about 8 per cent. moisture is stated to be stable and to have been kept for 22 years without loss of baking quality by B. Thomas, *Zeitschrift fur das gesamte Getreidewesen*. The tin cans must either be lined with paper or sealed under vacuum owing to the oxidative action of the metal on the flour, whereby rancidity develops. One of the principal changes in stored flour is hydrolytic liberation of free fatty acids and drying retards this. Vacuum drying also sterilises the flour and thus contributes to its stability.

Toast

The perusal of an article entitled "Scoring of toast and factors which affect its quality", by W. H. Cathcart and E. J. Killen, of the Research Department, American Institute of Baking, Chicago, published in *Food Research*, tends to make the reader more critical of the flaccid or burnt abominations which are served up under the name of toast. It is probably one of the least standardised of prepared foods, not only when it is prepared by non-professionals or semi-professionals in the home, but also as presented in most teashops and hotels.

"Good toast has an appetising golden brown colour; a smooth, crunchy, tender, toasted surface; a tender crumb underneath the toasted surface; and a pleasant, sweet, appetising odour and taste." Breakfast would be divested of some of its terrors if such a specification were strictly adhered to.

We read that good bread makes good toast and bad bread makes bad toast, which might have been expected, but that bread from 18 to 30 hours old makes the best toast may not be so self-evident. Included in a long list of items of composition influencing good qualities of toast are the use of diastatic malt, dry skim milk up to 3 per cent., 4 per cent. of powdered whole milk, increasing shortening up to about 3 per cent. in formula, cool dough, and so on.

The authors have developed a toast score which is proposed for use in scoring bread for toasting quality. Their final dictum is that "the toast of to-day is quite different from that made 10 or 15 years ago, which is due to the fact that formulas are richer, toasters are different, and people's tastes and likes have undoubtedly changed".

Health Clowns

They conduct bakery propaganda in the U.S.A. in a picturesque way. Bakers' Day celebrations at the World's Fair on July 17 included an essay contest and a clowns' parade for children. Awarding of prizes by radio stars for the best essay on "Why is Bread the Staff of Life?" was one of the star turns. "A parade of clowns and animals, with music by a band, was stepped up by a special health clown who brought a message from the baking industry direct to the children."

Clowns are irresistible to children, and it is quite possible that a procession "stepped up" by a health clown, followed perhaps by the effigy of a huge loaf, hung round with bottles of vitamin B_1 and calcium carbonate, might put things over to our young generation better than anything!

Venison

An organised scheme for the collection and disposal of venison has been under consideration, writes Mr. Frank Wallace, Deer Controller for Scotland, in *The Field*.

It is estimated that not less than 15,000 deer should be killed next season. These would form a useful addition to the nation's food supply if the distribution were properly organised. The chief items of the scheme are: The establishment of depôts or centres; the registration of deer forest owners with depôts and agreements as to sale of venison; and minimum price to deer forest owners. It is estimated that one thousand tons of venison might be produced if necessary, which is not negligible and should not be allowed to go to waste.

The Deer Controller points out that the public are at last beginning to appreciate the merit of venison as food. It is a little surprising to learn that venison has often been disguised as mutton or beef. It is also pointed out that the heads and feet of the hinds are thrown away—an obvious waste of valuable material if it could be economically conveyed to places where it could be elaborated. Against the scheme are the increased difficulties in obtaining ammunition, but it is hoped that arrangements can be made to render it procurable.

Food in the Highlands

In these days any discussion on food and diet in different localities is interesting, but Professor Cathcart's report on the diets of families in the rural areas of the Highlands and Islands of Scotland, published by the Medical Research Council, is doubly so. Not only is the present situation considered but there is also given a useful historical survey. Most doctors in this area state that the crofters' diets have improved greatly since the beginning of the century. Oatmeal is still an important, but no longer the main, item in the diet. There is an increasing consumption of butchers'

meat, and nowadays imported fruits such as apples, oranges and bananas, and certain vegetables are recognised articles of diet. Some practitioners, however, believe that the dietary is deteriorating, and they complain about the lack of home-grown vegetables, the diminished consumption of fish, and the scarcity of milk in winter. Tea and shop-made bread are being used more freely than hitherto, and there is an increasing consumption of corned beef, pastries, and cheap sweets. We do not share the gloomy forebodings of the minority of doctors that believe the change to be disadvantageous and agree with the majority who believe that variety is the spice of life.

Physical Problems in Industry

Of considerable interest to research workers in the food industry should be the recent announcement by the Institute of Physics, in which help is offered through the Institute's panel of consultants.

There may be some who in the present emergency find themselves presented with technical problems in applied physics of which they do not happen to have had first-hand experience. Through the panel, enquirers are put into touch with those physicists most likely to offer immediate practical suggestions in any particular case. The subjects which can be dealt with cover all branches of physics, both pure and applied, including physical measurements and testing, the design and supply of scientific instruments for special purposes, and the control of processes by physical means.

By acting as a clearing house in this way, and supplementing existing official and unofficial organisations, it is hoped to help in the national effort by directing attention to existing solutions of difficulties which, while appearing to be new problems, are often well known in other fields.

Vegetable Oils for Margarine

Apart from the principal oils—coconut, groundnut, palm kernel, cottonseed and whale—used in margarine manufacture, there are several alternatives, which were discussed by a correspondent to the Trade and Engineering Supplement of *The Times* for July. Sesame seed is a source of an edible oil used in several European countries for margarine and soap manufacture, and is chiefly supplied by China and India. It is suggested that additional supplies of soya beans might be obtained from Manchuria and Korea. In 1932-35 our imports were 160,000 tons a year, and the total amount exported from those countries is 2,000,000 tons a year. Babassu nut oil, derived from the Babassu nut of Brazil, is not used in this country, but is used for margarine in the United States. It is the chief item of many oil-yielding nuts and seeds of which Brazil is an important potential source. Tea seed oil is a high-grade oil resembling olive oil, but is more suitable for use as a culinary and salad oil than for the manufacture of magarine. Kapok seed yields another oil which is suitable for the manufacture of margarine and cooking fats, and is exported from the Netherlands East Indies.

Fishiness in Pork and Bacon

Some interesting experiments are described in the Annual Report for 1939 of the National Institute of Research in Dairying. When feeding pigs on 10 per cent. herring meal or other comparable diets to which had been added the amount of crude herring oil present in 10 per cent. herring meal, no objectionable flavours were noticeable in the flesh of the animals in the pork stage, nor when they were cured for bacon.

Another experiment on similar lines demonstrated that using 10 per cent. herring meal plus the amount of oil present if 20 per cent. of the ration had been herring meal, a definite taint was evident in portions cured as bacon or ham and that the pork was not of good quality. A taint was also produced when the herring oil was replaced by an approximately equivalent amount of methyl esters of the most unsaturated fatty acids of herring oil. The analysis of the fat revealed the passage of an unusually large amount of these acids from the ration to the pig fat. The taint was thus definitely traced to this fraction of the oil. As a result of this investigation it appears that there is a future in this country for herring meal as a pig-feeding stuff. At times such as these a home-produced meal from herring offal alone might be of great importance. It is suggested that manufacturers of herring meal might endeavour to reduce the oil content to from 5 to 6 per cent., and whether this is achieved or not that pig feeders will be safe in using herring meals in which the herring oil does not exceed 0·5 per cent. of the ration.

Micro-Tests for Phosphorus, Arsenic and Antimony

The detection of phosphorus, arsenic and antimony micro-chemically in organic mixtures is preceded by oxidation to the corresponding inorganic anions. Phosphorus is detected by its characteristically double magnesium ammonium compound. To distinguish arsenic and antimony, reduction is effected by a tin-platium "couple", and a modified Gutzeit test is applied. The foregoing is the subject of a paper by Cecil L. Wilson, M.Sc., Ph.D., A.I.C., in *The Analyst*, July, 1940, in which the method is fully described. The sensitivity of the tests varied with the compounds, but, in general, in mixtures containing 5 to 20γ of phosphorus compound, 10 to 20γ of arsenic compound and 20 to 30γ of antimony compound the elements could be detected correctly. Although these figures are not so low as are given by Feigl in "Qualitative Analysis by Spot Tests", they apply to mixtures, for which his methods are not suitable.

Taboos in Food Advertising

In a previous issue we commented upon the Wheeler-Lea Amendment, which gave the U.S.A. Federal Trade Commission extended jurisdiction and more effective control over advertising which, in the Commission's opinion, is judged false and misleading. *Food Industries*, July, 1940, gives a check list of some F.T.C. taboos—advertising statements to which the Commission has objected in the past.

Although composed of "thou shalt nots", there is a wealth of suggestions in the list. Beliefs popular and persistent among laymen in this country are fallacious in the opinion of the experts. Everybody has heard of the "bread and butter diet" for slimming, but the American bakers must not make such claims as: "Bread is necessary in a reducing diet to burn up fats and sweets". Or that: "One may grow thinner and eat anything, if bread, because of its ability to burn up damaging fats, is included in the diet". Yeast advertising comes in for many inhibitions. It must not claim that yeast will cure constipation, bad breath, boils, acne and pimples, and the advertiser must not say that "it will 'clear' skin irritants out of the blood unless limited to such skin irritants as competent scientific tests prove can be removed by the product". Some makers of soft fruit drinks were forbidden to use the word "fruity" or "purest ingredient" in connection with any product that is synthetically flavoured to imitate the flavour of a fruit. The censorship of advertising must involve considerable work and has already produced the new profession of "Advertising Regulations Consultant".

Nitrite in Fish Curing

Tarr and Sunderland, of Pacific Fisheries Experimental Station, Prince Rupert, B.C., have actively continued their work on the use of nitrite as an agent in the inhibition of bacterial spoilage of fish. In Report No. 44 the latest results are communicated. Previously the authors had pointed out that nitrites in concentrations not exceeding 200 parts per million (calculated as sodium nitrite) of fish flesh strongly inhibit its bacterial spoilage. The conditions under which

nitrites are able to retard such spoilage are that nitrite, when present in brines, pickles or fish flesh in the small concentrations usually employed, will inhibit bacterial growth and the spoilage contingent upon such growth, only when these substances have an acid reaction.

Fresh fish muscle has only a slight degree of acidity, and although nitrite (200 parts per million) hinders its bacterial spoilage to a significant extent, there seems little doubt that by adjusting it to a more acid reaction (say *p*H 6) the germicidal activity of nitrites would be considerably enhanced. So far the problem of increasing the acidity of fish muscle without affecting adversely its appearance has not been satisfactorily solved.

Sugar and Jam

The function of sugar in jam making is not merely to sweeten it, although that is an important *rôle*. It also preserves it, helps it to set, and adds to its bulk. There is no single substitute that can perform adequately all these four functions. Saccharin can be used for sweetening, but a discriminating palate soon detects its peculiar bitter sweetness. Preservation can be achieved by asepsis or antisepsis. In the former, which is employed in fruit bottling, the pots are sterilised by heat before use and melted paraffin wax is poured on the surface, or airtight screw-capped jars are used. The second method is complicated by legal restrictions and the only preservative permitted is sulphur dioxide, and that to a very limited extent only in commercial jams. Gelatin will make the jam set, but it encourages the growth of moulds. It should be remembered that pectin does not work without sugar.

Disinfecting Jam

By aseptic and antiseptic methods Good Housekeeping Institute has evolved a formula for jam having as sweetening agents a much smaller proportion of sugar than the normal, plus saccharin. This jam contains 0·3 gr. saccharin, ½ oz. gelatine and 4 ozs. sugar to every pound of fruit. The recommendation is that jars should be sterilised prior to filling and that preservatives, among which salicylic acid figures, may be used. Obviously the jam is for domestic use. It is thereafter suggested that the sterilisation of the jars or pots might be unnecessary if benzoic or salicylic acid is used, but again that "it would be unwise to dispense with these precautions until the antiseptic method has had an extended trial. The use of both asepsis and antisepsis may seem like wearing braces and a belt, but the preservative will in fact make up for errors in technique and help the jam to keep after the pot is open". Adopting the G.H.I.'s analogy, we have a leaning towards braces. An "error in technique" in the home kitchen in adding salicylic acid might have effects different in kind from but greater in degree than a too-large belt.

British and Alien Scientists

There has been a lot of sympathy expressed in letters and articles in the press for interned alien scientists, and it is pointed out how valuable to our war effort would be their work. There has been a considerable number of hard cases, many of which have been put right, and doubtless the hysterical and piteous word pictures of their plight will soon cease from harrowing our tender feelings.

The old adage about the prophet not being without honour save in his own country is an unduly pessimistic one, but it would be interesting to know the extent to which the brains of our native scientists are being used and to what extent they are represented by cards buried deep in the files of the Central Register.

Nobody weeps for them (as many do for their alien counterparts) nor deplores their sense of frustration. In any case, those scientists who *are* used should not have to act as consultants standing to attention while the non-technical administrative side fires questions at them, the answers to which they (the administrative side) may not fully appreciate. Scientists should be given authority to make investigations on their own initiative, to solve problems emerging therefrom and to apply practical measures for putting their discoveries into practice.

Soya Bean

We of the Western world have been slow to recognise and make use of the value of soya beans. It has been used recently to a limited extent in confectionery but in a very half-hearted fashion. The Chinese have used it for centuries and long ago realised its enormous food value. The soya bean is the richest of all vegetables as far as food value goes. It takes up more nitrogen from the air and utilises the mineral matter of the soil more economically than any other plant. Soya flour contains 40 per cent. protein—over five times as much as English wheat—20 per cent. fat and 20 per cent. carbohydrate. Since its recognition in Europe early in this century its cultivation has increased, particularly in Bulgaria and Roumania. The *Edelsoya* forms a staple part of the diet of the troops in those countries, and in Berlin it is now openly boasted that but for the soya in their diet the soldiers could not have moved so rapidly into Poland. It is now being used in a variety of ways in this country, and recently Dr. Helen Mackay has investigated a new field. She has fed forty-eight babies on milk made from equal parts of soya flour and dried milk powder, and has found that, in spite of some minor disadvantages, this mixture provides a cheap and efficient substitute for breast or cow's milk.

Foods in Western Australia

The Annual Report of the Chemical Branch, Mines Department, for 1938, indicates that the work of the branch is divided into three sections: (1) Food, drugs and toxicology; (2) mineralogy and geo-chemistry; and (3) agriculture and water supply.

The Food and Drugs Advisory Committee dealt with several important questions which had arisen during the year, among which was the emendation of the regulation permitting the addition of 0·3 per cent. of boric acid in butter. It was also decided not to add *n*-Butyl-*p*-hydroxybenzoate to the list of permitted preservatives in food.

The very high proportions of vitamin C found in a large yellow guava, amounting to 1·10 mg., and in a papaw, 0·98 mg. per gram were noted. Figures for other fruits agreed closely with those found in other parts of the world, the richest common fruits being orange, mandarin, lemon and "banana passion fruit," also known as taxonia.

Fresh vegetables were added to the list of foodstuffs in which the amount of arsenic must not exceed the equivalent of 1-100th grain of As_2O_3 per lb., and that of lead must not exceed 1-7th grain per lb.

Silage

We have referred on other occasions to the growing attention paid to the question of preserving grass by what is known as silage. This year has been particularly suitable and before the winter sets in many tons of silage will have been made. Many farmers who have never adopted this method are now displaying intense interest. This is rather strange, as silage is nothing new—indeed, the process was introduced over fifty years ago. The type of crop that could then be successfully employed was limited, and it was considered essential to use large concrete tower silos, which were beyond the means of most farmers. To-day most of the limitations have been eliminated, and a further incentive to the use of silage is the scarcity of feeding stuffs owing to the war. The Ministry of Agriculture has arranged demonstrations to popularise the process and, apart from green crops grown specifically for silage, it is urged that all surplus grass and other crops should be ensiled against winter scarcity. The silos are no longer expensive and there are now cheap portable ones available in sections of wood or wire mesh lined with special paper.

FORTIFIED WHITE BREAD

WHAT THE CHEMISTS THINK

Leading cereal, bakery and other chemists express their opinion on the Government's recent proposal to add vitamin B_1 and some form of calcium to white bread. This symposium presents a cross section of scientific opinion within the industry.

A. L. Bacharach, M.A. (Cantab.), F.I.C.

The Ministry's proposals have received general support from those concerned with problems in nutrition, indicating a belief that it is at least a move in the right direction. It may be convenient to summarise here the arguments for and against the proposed additions.

PRO. A. (*a*) Vitamin B_1 shortage is common in peace-time and likely to be commoner in war. An average (adult) deficiency of 200 to 400 units per day might be largely made good (200 units = 0·60 mgm.) from 1 lb. of the proposed loaf.

(*b*) Calcium, as carbonate or other mineral salt, is completely assimilated and likely to be short in many diets. Its addition to bread, though not "natural", is simple to arrange and helps to balance the adverse phosphorus to calcium ratio of a cereal food.

CON. B. (*a*) No clear statement has yet been made as to the amount of added B_1 present per oz. or lb. of the proposed loaf. Public statements have been expressed in terms of the "normal daily consumption", which might be anything from 2 to 20 oz. This policy is unpleasantly reminiscent of a similar obscurantism over margarine: we have not yet been informed what Ministry and manufacturer believe to be "equal in vitamin content to summer butter".

(*b*) The reinforcement with B_1 is inadequate (see *Brit. Med. J.*, 1940, ii, 125, July 27). If 12 oz. is the basis (as assumed in A (*a*) above) of computation, the M.F. loaf will contain only 40 per cent. of the average amount of B_1 in wholemeal bread.

(*c*) Whole wheat contains other vitamins besides aneurin: riboflavin (0·12 mgm. per lb.) and nicotinic acid (25 mgm. per lb.) are both known to be essential for health. The M.F. loaf may create a false sense of security and make successful propaganda for wholemeal bread even more difficult than heretofore.

(*d*) The addition of lime salts to bread has always hitherto been regarded as adulteration. The new precedent is a bad one. Calcium intake should be increased by increasing the consumption of milk and cheese, not by putting chalk into flour.

(*e*) The most important deficiency of white compared with wholemeal bread, apart from its vitamin B_1 content, is its poorness in iron. The difference per lb. is 5 to 6 mgm.—half of the daily marginal requirement. The addition of 30, or even 15, mgm. of ferrous sulphate to every lb. of bread would cost next to nothing, and would make certain the prevention of the most prevalent of all deficiency diseases—nutritional or "secondary" anæmia—especially among the large and growing population of industrial women workers. Such an addition would be in exact accordance with the views of the Accessory Food Factors (Vitamins) Committee of the Medical Research Council, whose recommendations (*Brit. Med. J.*, 1940, ii, 164, August 3) were published *after* the Ministry's announcement of its bread programme.

(*f*) If, as is believed, the addition of calcium to bread is to be as calcium carbonate, this is due to a confusion of ideas about the *rôle* of phytin (organic) phosphorus in its effect on calcium metabolism. The use of calcium phosphate would improve the utilisation of both calcium *and* phosphorus in a high phytin-low calcium diet, because the phosphate ion will displace an equivalent amount of phytic acid, if sufficient calcium is provided with it.

(*g*) The "unnatural" reinforcement of bread with lime, even if defensible on nutritional grounds, is likely to discourage the consumption of milk and cheese, and will therefore do more harm in the long run than good in the short.

(*h*) No machinery exists for securing that the loaf, as it reaches the public, will contain what the Ministry prescribes. Public analysts will be loath to carry out vitamin tests—even those possible by chemical and physico-chemical means—and it is not even certain that proceedings under the Food and Drugs Act would bring public redress. The Ministry of Food should have statutory powers to enforce its own requirements and machinery with which to enforce them.

The conclusion would appear to be that the addition of aneurin is certainly of benefit, but should be regarded only as a provisional move towards a yet unattained improvement in dietary standards; that the addition of calcium, though good in itself, should not be regarded as more than a stop-gap until more milk is being consumed; that the failure to add iron is much to be deplored.

Edmund B. Bennion, M.Sc., F.I.C.

The announcement by the Government of their intention to fortify white bread with vitamin B_1 and calcium salts was received by the baking trade with considerable interest. Particularly was attention given to the pronouncement that these additions would not interfere with the baking qualities of the flour.

Since this pronouncement was made there has been further information concerning the nature of the vitamin B_1 supplement as well as the possible calcium addition.

As far as the value of the addition of aneurin is concerned, the whole thing seems to be in the nature of a gigantic experiment and most interesting it should prove. It will be costly; but there is this to be said in its favour, that it is better to commence such an experiment before the health of the nation has been affected by war-time conditions rather than wait for signs of the disorders normally associated with vitamin B_1 deficiencies showing themselves.

The value of aneurin as compared with naturally occurring B_1 has yet to be proved on a large scale in human dietary, but from all the knowledge of the subject which is available it seems probable that no harm can come from this addition, and much good may result.

The addition of calcium salts is, however, a more debatable question. Twelve months ago the Ministry of Health were about to issue an order in connection with the new Food and Drugs Act concerning the addition of permissible substances to flour and bread.

Under these regulations the use of all calcium salts was to be prohibited. It was pointed out when a deputation from the baking industry interviewed the Ministry that this even precluded the use of hard water, a situation which would obviously have been impossible. Apparently then, however, the addition of lime and gypsum was to be prohibited. Now, twelve months later, the whole position seems to be completely reversed, and it is suggested that calcium carbonate at the rate of ½ lb. per sack of flour should be used. What evidence has been obtained during the intervening period to warrant such a complete *volte face*?

If the addition of calcium lactate had been suggested we might have understood the position better. Apparently the cheapest lime salt is being considered—perhaps as an offset to the relative expensiveness of the aneurin addition.

Such additions are to be made by the miller, so that all flour will be similarly treated, provided that all mills are fitted with the mechanical devices for allowing the uniform admixing, and provided that every care is taken to see that such uniformity of admixture is maintained during all working hours of the mills. Presumably the same mechanism will be used as is now used for the addition of persulphate or benzoyl peroxide where such substances are added. It is still quite common to find flour overtreated with these products where some mechanical defect has shown itself either through a choke in the mill stream or elsewhere. What will happen, we wonder, to the consumer of the bread who may obtain 10 or 20 times the amount of vitamin B_1 and lime in his loaf through such a fault? It is possible that the excess of lime may make the bread unproduceable or at least most unpalatable and so save the situation, or, alternatively, the consumer may get a real kick out of eating such a loaf due to the surplus vitamin B_1.

When lime salts are to be considered, the question of utilising whey, which is available in increasing quantities, must not be

overlooked. It can now be prepared in such a way as to make it a most suitable addition to bread, for a product superior in every way to skim milk powder can be marketed, the use of 2½ per cent. of which will double the calcium content of a loaf, whilst at the same time producing a loaf of superior eating qualities.

The utilisation of dairy by-products is of great importance, and consideration to the addition of calcium salts derived from such sources should not be overlooked. Although the quantity available may not be sufficient for an all-round addition, it would prove most valuable for the feeding of children and others who require a readjustment of calcium intake over and above that prescribed by the suggested addition of lime.

From the angle of practical bread production the addition of aneurin (vitamin B_1) may not provide any problem apart from perhaps some modification of dough consistency probably resulting in a very small decrease in yield. The addition of calcium carbonate will most probably require the use of extra yeast, probably at the rate of ½ lb. per sack, to counteract the influence of the lime on the yeast and dough itself. This would mean a further small increase in production costs under existing methods of working.

J. Gordon Hay, F.I.C.

The present time could not be more appropriate for the addition of aneurin, for, as Sir John Orr says, it is the vitamin that prevents mental depression and a defeatist outlook, and this deficiency in the German diet during the latter part of the last Great War was one of the causes of their defeat.

The addition of calcium to bread is a thing I have been advocating for a long time. The fact is that if we feed our stock on wheatfeed or other material lacking in calcium, but of high phosphorus content, and do not add sufficient calcium to give a calcium : phosphorus ratio similar to that of the milk of mammals, such stock will be a failure, with rotten, brittle and deformed bones; but this state of affairs affected the pockets of the farmers, so scientists put it right years ago by giving the correct mineral balance in the diet of stock. But in the highest animal—man—it was regarded almost as wicked to attempt to interfere with bread made from a wheaten flour, as Nature supplied it, so no calcium or other deficiency was allowed to be added to it. At last, however, we are becoming more enlightened, and are shortly to give ourselves an equal chance for good health, and sound bones and teeth, as we gave to our pigs years ago.

I am not in favour of the suggested possibility of the addition of calcium carbonate as a source of calcium, as I feel that there is some danger in several ways to the milling and baking trades with this salt, and in my opinion some other source of calcium should be used, and as several calcium salts are already known as actual bread improvers it should not be difficult to find the correct one. But these points will no doubt be discussed by the parties concerned before a final decision is made and approved by the Ministry of Food.

One point on which I think the public should be informed is the cost of this addition, as according to an article in one of the weekly papers, for the cost of aneurin they gave the full retail price of £3 per gram, and worked out the millions of pounds it would cost the country per annum for this addition; this cost at the rate suggested of £3 per gram would add 12s. per sack to the cost of flour, which, of course, is absurd, and leads the public to believe that this addition is being made at enormous cost to the country.

The following ratios of calcium : phosphorus are interesting :

	Ca : *P*
Human milk	1·35 : 1
Cow's milk	1·26 : 1
Fruit (average)	1·2 : 1
Green vegetables	2·2 : 1
Carrots	1·55 : 1
Watercress	1·8 : 1
Eggs	1 : 2
Potatoes	1 : 3
White bread (London area)	1 : 5·5
Wholemeal bread (London area)	1 : 8
White bread (American)	1 : 2·6
White bread (London area), plus suggested calcium addition	1 : 1·2

The white bread (London area) contains nothing but straight run flour, London water (about 20° hardness), yeast and salt. The American bread contains condensed milk, hence its better ratio. The bread with the suggested calcium addition is very near the ratio of the protective foods, above the line. In fact, it is better than that of eggs, while the ratio of wholemeal bread is the worst of all.

It would therefore appear that the new white bread with aneurin and calcium addition will be a very great improvement from the nutritional point of view on the present loaf, and no doubt the Ministry of Food, possibly in conjunction with the Ministry of Health, will make large-scale observations of the effect on sections of the community, to find out if any alteration in the amount of aneurin or in the quantity or form of the calcium salt is advisable.

So one feels that it is a far-sighted policy of the Government—especially at the present time—to adopt this scheme, to make full use of the vast amount of work that has been done by dietetic and nutritional experts in the last few years. In the past it has seemed that Governments have always been ready to make rapid use of new scientific devices for the destruction of man, but very slow to adopt methods for the improvement and well-being of the people, so let us hope that this is the beginning of a reverse of the old policy.

C. H. Herd, B.Sc., Ph.D. (Lond.), F.I.C.

White flour has frequently been attacked not only by food cranks but by nutrition workers. The main points of attack have been its low vitamin B_1 and mineral contents and its lack of roughage. Times without number the advantages of wholemeal over white flour or bread have been extolled in these respects. Such attacks have usually ignored any virtues of white bread in the diet, whereas actually it does have a very definite value as an "energy" food, and, moreover, is popular with the vast majority of people, particularly among those who do the hardest work. It provides a large part of the calories of a general diet, and is, of course, more assimilated than the wholemeal. Furthermore, it is never eaten alone, but with other foodstuffs, with which it acts in a complementary manner and contributes in this way to a balanced diet.

There is an economic aspect, too. No part of the wheat berry is wasted—what is not fed to humans goes to animal feeding, and may serve a more useful purpose and be more completely digested. Mr. Boothby pointed out his side of the economic question quite clearly—namely, that it was necessary to hold large reserve stocks of flour at the present time, and that white flour keeps better than wholemeal. Secondly, the animal feeding stuff position is difficult, and the manufacture of white flour releases 28 per cent. of the wheat grain for animal feed.

I have always stressed both privately and publicly that millers *must* face facts in this difficult question; they must accept scientific evidence. It has been proved that the wholemeal contains important dietary factors in greater quantities than white. The question therefore arises: Is the diet of the general public deficient in these factors? If so, there is a call to the milling industry to overcome economic difficulties and to enhance the nutritive value of bread. Many dietary surveys have been made, and evidence generally points that, at any rate, in lower income groups, vitamin B_1 and possibly calcium is deficient. The industry has accepted this, and for several years has worked on the problem, resulting in the present proposal of the Ministry of Food. The alternative apparently is to force all the populace to eat standard bread (as a partial protection), or to go wholeheartedly for total protection and eat nothing but wholemeal.

The advantages of the present proposal are obvious. Stocks of flour can be held; no interference with supply of animal feeding stuffs; people can have which they like, brown or white bread, and, finally, the nutritive and protective value of white bread is enhanced. The blending value of bread and therefore its use as a complementary foodstuff is not interfered with. I believe that this is a very important and valuable dietetic step in the life of this country. The actual quantities and the exact form of the addition have not yet been announced; with vitamin B_1 the bulk quantity will naturally be very small, but if the intake is raised by 100 I.U. per day it will only just bring some of the lower income groups into the range of minimal requirement and far from the optimal requirement. However, by the fortification of flour or bread, it is the lowest income groups with their largest consumption of bread which will get the biggest supplement. Now as to the calcium addition—the actual salt to be used is not yet decided, nor naturally the quantity. Numerous factors have to be taken into consideration such as the assimilation of the salt and the calcium-phosphate ratio in order that maximum value can be obtained. At the present moment these matters are under consideration, and no statements have been made, and all assumptions that it will be calcium phosphate or any other salt are unjustified. When the decision has been made then will be the time to criticise.

The millers themselves are faced with the problems of cost of mixing in the small quantities and of getting the supplies. It can be said immediately that on present calculations the cost will be relatively small, and only fractional on the cost of a loaf of bread. Supplies are being assured because, as the industry is working as one body its average requirements can be predetermined. As to the question of mixing in small quantities, I have no fears at all that this can be done in a very uniform manner; there are feeding machines in existence, which will deliver regular small quantities into the mill stream, after which adequate mixing can be achieved. We are informed that a method of estimation has been developed, which will enable sufficiently accurate determinations to be made to ensure (i) that the addition has been made, and (ii) that the addition is in regular amounts.

Is there any danger of excess either of vitamin B_1 or of vitamins generally if artificial additions are made to foodstuffs? A very important question! This involves our general dietary policy, which must be controlled by the Ministry of Food in conjunction with the Ministry of Health, but these ministries must work under scientific advice. One recalls Sir John Boyd Orr's Jubilee Memorial lecture, in which he appealed for a social and economic system rebuilt on a basis of scientific fact instead of on political theory. So far only two foodstuffs have been permitted to undergo fortifications—margarine and bread—in both cases scientific evidence was accumulated before that permission was granted. Controlled in this way, general benefit can be obtained, but any attempt at unrestricted additions to foodstuffs must be fraught with danger and must be opposed.

D. W. Kent-Jones, Ph.D., B.Sc., F.I.C.

One of the most outstanding events of the year has been the announcement of the compulsory fortifying of white flour with vitamin B_1 in the near future. This is not simply a war measure. It is an open secret that the British millers have been actively investigating the subject for some years and have undertaken liabilities of many hundreds of thousands of pounds on the project.

There would be an economic upheaval of a very serious nature if, owing to its unpopularity, bread was not eaten to anything like its normal extent. However, the solution now reached does not concern the use of germ or milling offals. The proposal is to add 0·2 gram per sack of synthetically made vitamin B_1 or aneurin, and the production of this chemical substance is now being accomplished on a commercial scale. Presumably owing to the suggestion that the millers would definitely undertake to use very large quantities, the cost of production has reached a very low figure compared with that of even a few months ago. Aneurin is a white crystalline substance, and the addition of it to flour makes no difference whatsoever to the loaf as regards its method of production or its taste, colour, smell, etc. The only difference is that bread made from such fortified flour will have an appreciably higher B_1 content and, in those cases where people do not normally get sufficient B_1 in their diet, there will be an appreciable increase with, possibly, beneficial results.

The solution of the problem, provided it is a financial possibility as now seems to be the case, will meet with everyone's approval. The millers will have thus removed one of the main criticisms of this product. There will, however, be quite a number of points to be considered, especially in connection with the control of this very minute addition. It will, apparently, be a legal obligation to add the correct amount of B_1, but as the treatment may cost approaching 1s. per sack of flour (280 lbs.), the miller will obviously want to be careful not to add more than is necessary. This will entail very careful control and checking by the cereal chemists, and it is far from certain that this can be done as efficiently as some people suppose. There has been very little collaborative work to check up on this very difficult problem. It is not that this problem is insolvable, but only that it still requires careful study and attention. It is also possible that there may be other means of ensuring that white flour contains the increased amount of vitamin B_1 than by the addition of the synthetically prepared compound.

With respect to calcium, the situation is quite different. Vitamin B_1 is a natural constituent of the grain and modern milling methods largely eliminate it. Its replacement, therefore, in the white flour is a logical step. Wholemeal has never been a particularly good source of calcium, but, apparently, the Ministry of Food have decided that steps should be taken to supplement the general diet of the country by a calcium addition and have chosen white flour, purely as it is a convenient medium as a means to put this scheme into operation. The situation, therefore, is quite different from that of the addition of vitamin B_1, and many will regard with considerable misgivings this proposal to turn white flour into a mild patent medicine. If it is necessary to add calcium to the diet, it may later be thought equally as necessary to add other elements. Is it suggested that flour should also be the medium for these? It is certainly the thin end of the wedge, and the milling and baking industries ought to watch the situation very closely.

Then, again, there is the important question as to the form in which the calcium should be added. The present proposal is not clear, but it is generally assumed that there will be an addition of something like 200 grams of calcium carbonate a sack. The use of calcium carbonate raises further problems. Unless the right type of calcium carbonate is taken, the acid balance of the loaf may be significantly disturbed, with the result that there may be commercial difficulties with respect to the colour of the bread. It is even possible that bread made from flour containing calcium carbonate will tend to develop rope more easily than the normal bread of the present day.

Some authorities consider that in spite of the unsatisfactory calcium/phosphorus ration in cereals, it would be better to add the calcium in the form of calcium phosphate. If calcium is to be added, little exception could be taken to calcium lactate, but presumably this is ruled out on the score of expense; nevertheless, the question of expense does not seem to have been allowed to interfere when considering the B_1 addition. It is generally realised that complaints sometimes arise from incorrect or over-treatment with the chemical additions at present being added to flour for the purpose of improving or bleaching it. This fact has to be borne in mind, particularly if any interference is likely to take place to the acid balance of the loaf.

A considerable amount of work is obviously wanted on these problems and, so far, the situation has not been made very clear by the Ministry of Food to those who have to guide industries in these matters. It is sincerely hoped that the present proposals will not be put into operation until the position is considerably clarified and proper control can be exercised.

G. W. Martin

The recent Government announcement that white flour is to be fortified with vitamin B_1 and a calcium salt has aroused tremendous interest, not only in scientific circles, and in the milling and baking trades, but also amongst ordinary consumers.

It is believed that the B_1 addition will be in the form of the pure synthetic vitamin, aneurin, used at such a rate as to increase the average daily intake by 100 International Units (I.U.) per head, while ½ lb. of calcium carbonate per sack of 280 lbs. of flour is set forth as a "possibility" for the calcium salt.

It is known that extensive small and large scale tests have been carried out, and it has been shown that the aneurin has no effect on fermentation and is not destroyed during baking. Even so, the baking trade appears to be receiving these proposals with its customary caution not unmixed with distrust, apparently on the grounds that the trade has been kept in the dark about this work, while many bakers are prejudiced about any chemical treatment of flour. There is some justification for the latter view as most bakeries have experienced trouble at various times due to accidental overdosing of their flour at the mill by such common additions as persulphates and bromate, and herein lies one very obvious difficulty with these proposed additions of B_1 and calcium, although we are glibly assured that their uniform distribution will present no difficulties. Such is not the view of some experts in the milling industry. However, it should be possible to maintain strict analytical control over the flour, as B_1 can now be easily determined in any well-equipped chemical laboratory by the thiochrome method, whereas previously only lengthy and expensive biological methods were available.

Actually, it is considered that bakers should give a hearty welcome to this B_1 flour, if only because it automatically destroys the main peg on which much of the often misguided criticism of the modern white loaf has been hung. Also, it should be appreciated that the alternative to the addition of B_1 was presumably an increase in the extraction of flour, resulting in a darker loaf, and almost certainly decreased sales. Furthermore, as lack of appetite is frequently due to B_1 deficiency, it is not inconceivable that the new loaf may lead to increased bread consumption. Happily, the Ministry of Food realised that the great majority of people have a decided preference for white bread, but at the same time they could not neglect the overwhelming scientific evidence that more B_1 should improve the general health of the population, so they have wisely decided that people shall have their white bread and B_1.

The only criticism one perhaps might make is that a larger addition seems advisable, as the proposed extra 100 I.U. per day is insufficient to bring the daily intake of many people in the lower income groups up to the daily minimum of about 500 I.U. for good health. As there is no evidence that even a very large excess of the vitamin is harmful there should be no danger even to those more fortunate persons with an already adequate B_1 intake. Presumably the expense has been the deciding factor limiting the proposed addition to 100 I.U. daily, as there can be little doubt that, say, double this amount would be even more beneficial.

So much for B_1, but while this vitamin addition has met with general approval in scientific circles there are some misgivings about the proposed calcium, particularly in the form of carbonate, although it is probable that the final choice of salt has not yet been made. It is well known that bread has a very unfavourable calcium : phosphorus ratio, and with many diets deficient in calcium, the addition of a calcium salt to redress this poor balance is certainly a sound plan. Also, it is of interest to note that while the ratio of calcium to phosphorus in many animal foods is adjusted by the manufacturers to the ideal level of 1-1½ : 1, it takes a major war to arouse the interest of the powers-that-be in corresponding human nutrition. Wholemeal bread in particular, with its high phosphorus content, and much of it in the form of phytin, which although itself unavailable to the body nevertheless tends to prevent the absorption of calcium, would be rendered much more nutritious by an addition of calcium.

The choice of a particular calcium salt is obviously rendered difficult by the fact that in addition to the nutritional aspect it must be available in large amounts and at a low price, considerations which rule out such salts as the lactate and gluconate. Again, acid calcium phosphate, already used in small quantities as an improver in ordinary flour, and extensively as the acid ingredient of self-raising flour, would not only raise the calcium content but also the already too high phosphorus figure. As regards the official "possibility", chalk, which is satisfactory nutritionally and also fulfils the quantity and price requirements, it has been shown that different grades produce vastly different effects, and that the very fine pharmaceutical type, for example, when used at the suggested rate of ½ lb. per sack will raise the *p*H of the bread by as much as 0·8, and thereby increase the liability to "rope" development during hot weather, while it also imparts a slight creamy colour to the crumb. Obviously, if calcium carbonate is finally adopted, it will be necessary carefully to specify the grade, and take adequate precautions against accidental overdosage at the mills.

It is to be hoped that in due course a complete statement concerning the actual salt or salts of calcium adopted, the quantities to be added, and the probable effect if any on the baking quality of the flour will be made to the trade, and then it is up to the bakers to co-operate in producing the best possible white loaf, and one which should compare favourably in nutritional value with wholemeal.

H. Stanley Redgrove, B.Sc., F.I.C.

The proposal of the Government to authorise the sale of only two types of flour for the purpose of making bread—namely, wholemeal, and white flour to which some form of calcium and vitamin B_1 have been added—is one which must arouse great interest on the part of all chemists in any way concerned with dietetics.

The opinion has been expressed, and does not appear to be unfounded, that vitamin B_1—owing to the general dislike of wholemeal bread—is the one vitamin in which the peace-time diet of the average English family is likely to be at all seriously deficient; and, in view of the effect on the nervous system of this deficiency, it is desirable that it should be made good, especially during a period of nervous strain. The Government is certainly to be congratulated on adopting a plan which does not aim at compelling folk to consume a type of bread which offends their palates. On the other hand, it is hardly possible to pass a scientific verdict on the proposal until and unless one is informed of the precise quantities of vitamin B_1 and calcium compound it is proposed to add, though presumably these will be quantities sufficient to equalise the vitamin B_1 and calcium contents of the two grades of bread.

It is difficult to justify the addition of calcium. In their work on *The Englishman's Food*, Professor Drummond and Miss Anne Wilbraham, commenting on the effects of the lower calcium intake caused by the introduction of white roller-mill flour in the nineteenth century, write: "There was, however, one curious result of the lower intake of calcium; stones in the kidney and bladder became much less common than in the seventeenth and eighteenth century".

If improved morale is to be attained at the price of stone in the kidney or bladder, one may query whether the cost is not too high. Nor need it be paid, as there appears to be no connection between vitamin B_1 and calcium, and white flour for bread making could be fortified by the addition of the vitamin only. If the Government's proposals are carried into effect, one must ask what food alternative to bread will be available for those who suffer from stone or fear that they may develop it. Certainly all good effects on the nervous system of an increased vitamin B_1 intake will be nullified if this fear is allowed to persist. If one item of the Englishman's food is to be officially fortified, or, more correctly, adulterated, with calcium, should it not be one containing vitamin D, or to which vitamin D could be conveniently added, and marketed for use in the diet of children only, seeing that it is they and not adults who need a high calcium intake?

A Correspondent to "The Lancet"

A letter, signed by R. E. Smith, states: "The Ministry of Health announces that vitamin B_1 and a calcium salt are to be added to bread. This procedure, according to *The Times* parliamentary report, has now been endorsed by the scientific committee and is heralded as 'a revolutionary step'. The virtues of whole-meal bread have been often debated and I do not propose to reiterate the arguments, but I wish to question the advisability of the revolutionary step.

Vitamin B_1 is partially destroyed by heat. As it will presumably be put into the bread before baking some of the vitamin B_1 will be destroyed. The Ministry realise that some months must elapse before sufficient vitamin B_1 is available to start the scheme, yet they propose putting it into a food in which some will be destroyed. I have assumed we can afford to waste no vitamin B_1, but this is hardly the truth. Have any cases of vitamin B_1 deficiency occurred recently in Britain except among those whose intake of alcohol has been so great as to prevent their having anything like an ordinary diet? I believe the answer is no, although this is not true of pellagra, due to B_2 deficiency. The English diet, though it does not favour wholemeal bread, is apparently not lacking in vitamin B_1.

We are not told what calcium salt is to be added to bread. An inorganic salt would stand little chance of absorption. Most of our calcium is derived from milk, where linked to caseinogen it is easily absorbable. The present milk policy should secure an ample supply for every child and adult.

Nobody welcomes improvements in our diet more than I do. Nevertheless, I regard 'the revolutionary step' of adding vitamin B_1 and a calcium salt to white bread as unscientific, wasteful, and unnatural."

Dr. T. Moran and Professor J. C. Drummond

In the course of a comprehensive article in *Nature*, July, 1940, entitled "Reinforced White Flour", the authors cover the points raised by the preceding letter. They say: "The increased intake of B_1 should materially improve our general health. Beriberi is rare in Great Britain, but the effects of partial deficiency, including lack of appetite, physical vigor and disorders of the alimentary tract, the nervous system and the cardiovascular system, must be widespread". The authors cite the experiments of Jolliffe in the United States in which signs of vitamin B_1 deficiency, artificially produced in five healthy subjects by withholding the vitamin, disappeared in three days on the introduction of increased amounts of aneurin in the diet.

The authors also state that, "due to the acid *p*H of flour, approximately 5·4, the aneurin is quite stable and there is no loss during doughing and baking".

M.R.C. Memorandum on Bread

The Accessory Food Factors Committee of the Lister Institute and Medical Research Council in a special article in *The Lancet*, August 3, while not discussing the addition of vitamin B_1 as such to white bread, says in connection with flour of 80 to 85 per cent. extraction that a 1 lb. loaf would give 300 to 450 I.U., an amount almost satisfying the total requirement. The committee is of the opinion that the change in this one dietary essential alone would benefit greatly the health of adults and children of all classes in Great Britain. With regard to calcium, the memorandum states that the public would be benefited by the addition of calcium salts to the flour from which bread is made. The production and consumption of milk, cheese and vegetables should at the same time be promoted to the maximum extent, in order to secure an adequate supply of calcium.

THE MILLING AND BAKING INDUSTRIES 1939-1940

Reviewed by D. W. KENT-JONES, Ph.D., B.Sc., F.I.C.

WE HAVE now been at war for close on a year and, like all other industries, those of milling and baking have experienced abnormal conditions.

Milling Industry

At the outbreak of the war the milling industry became controlled, and, in effect, was taken over by the Government. The mill owners essentially became managers for the Ministry of Food and have conducted their businesses on the lines laid down by the various orders of the Ministry. The miller no longer buys his wheat as he thinks fit. He merely uses the wheat allocated to him and mills it to extract a definite percentage of flour. Sometimes the wheats which he has allocated to him result in his using a wheat blend somewhat different from that he would have used if he had been the free agent he was in peace-time. Neverthless, war-time flour has not been greatly different from pre-war flour, and the only generalisation it would be fair and safe to make would be that, on the whole, owing to the wheats available, flours have been stronger and definitely higher in water absorption—*i.e.*, have been better bread-making flours—than used to be the case. There are, of course, no divides—that is to say, the flour has to be straight run, known as N.S.R. (National Straight Run). Thus, for the duration of the war, patent or top-grade flours of low ash content—the cream of the flour streams—cannot be sold separately and all flour has to be of one standard grade.

Available Wheats

Although the baker likes patent flour for certain high-class goods and the flour colour is jealously watched even for the normal everyday bread, yet little difficulty has arisen because of the absence from the market of patent flour. Actually, the mass of bakers will agree that the N.S.R. flour they are getting is perhaps as excellent a sack of flour as they have ever been asked to make into bread. There has been no lack of wheat and ample supplies of excellent top-grade Manitoba have been available. Lower-grade Manitobas have not been available, so that the miller has had an excellent mixture at his disposal. Indeed, the main difficulty has been the scarceness of the weaker wheats. Filler wheats—*i.e.*, those which neither require help from the strong members of the blend nor which can give help to the very weak wheats—have been mainly those from the Argentine. In general, the Plate wheat has been satisfactory and, fortunately, very regular. The increased regularity of these wheats has been a noticeable feature in recent years and is certainly due in part to the work of the Argentine Grain and Elevators Commission.

Baking Industry

The baking industry has not, so far, been interfered with to a great extent on the bread side, but this may come, as already it is proposed to restrict the types of loaves which can be sold. Difficulties with fats, and particularly the recent restrictions with respect to sugar, almond icing, etc., have, however, caused considerable heart-burning to the confectionery baker. Quite frankly, the baker does not seem to have been given a very fair deal. Sugar is still allowed to the sweet confectioner, the maker of chocolates, etc., but the poor baker must not be allowed to use any icing to make his cakes more attractive and to do what he has always done to meet the legitimate demand of the public. Actually, of course, the amount of sugar so used is not great compared with that used by the makers of sweets and chocolates, but certain psychological reasons seem to have played an important part in coming to the decision. If restriction of sugar is necessary, it would have been fairer to have acted in a bolder and more impartial way.

Difficulties may arise later with respect to distribution of bread, and it will certainly pay bakers to pay attention to the problem of making their bread in such a way that it keeps fresh for a good time. It is well known that some bread keeps fresher longer than other bread. This is largely due to the technique employed. Unless the correct stage of fermentation is reached before the actual baking takes place, then the bread will stale unduly quickly. Panary fermentation pays for watching and every aid should be given to the yeast to ensure that its action is vigorous and proceeds just so far but no farther. The dough must not be "green" or under-ripe and it must not be over-ripe. The bread from both types of dough will stale quickly. Bread made from doughs containing too little or too much water may also tend to stale quickly. Certain additional dough ingredients, such as gluten, will delay the onslaught of staleness.

Scientific Progress

Although the period covered is a war one, there have still been many scientific advancements made in cereal chemistry. The volume of these is, of course, restricted, as we are cut off from the main European countries. Thus the *Muhlenlaboratorium* used to publish each year many hundreds of interesting and useful papers from German, Scandinavian, and Dutch cereal chemists. Also, probably, many cereal chemists are diverting their attention to other fields, or, at any rate, are not publishing their findings at the present time. We shall presumably now have no contributions from France. America, however, has continued to publish many interesting advancements. It is not possible to mention all the principal scientific papers, but the following are worthy of attention.

Diastatic Activity

One outstanding problem which cereal chemists have been feverishly attacking concerns the action on flour of the various components of the enzyme known as diastase. What are the varying and various functions of *alpha*- and *beta*-amylase in flour and in the bread-making process? No longer does it suffice to consider diastase as a whole in its attack on starch. We know that *alpha*-amylase tends to produce from starch maltose and dextrin, while *beta*-amylase tends to produce mainly maltose and may continue the action of the *alpha*-amylase. We also know that the trouble which comes from the employment of flour made from sprouted wheat is due to excessive *alpha*-amylase activity.

Considerable enlightenment of the exact function of these enzymes has been made in the past year, although the situation is still far from clear. The matter has been investigated by L. E. Ehrnst, G. J. Yakish, and W. Olson (*Cereal Chemistry*, **16**, 724), who modified the Wohlgemuth method for determining *alpha*-amylase activity, and R. M. Sandstedt, E. Kneen, and M. J. Blish (*Cereal Chemistry*, **16**, 712), who have pointed out that to obtain a measure of *alpha*-amylase it is essential to have present an excess of *beta*-amylase.

Sandstedt and his co-workers suggest that *alpha*-amylase

units be considered as the number of grams of soluble starch which, under the influence of an excess of *beta*-amylase, are dextrinised by 1 gram of malt in one hour at 30° C. D. W. Kent-Jones and A. J. Amos (*Cereal Chemistry*, **17**, 265), have suggested a technique to obtain a "dextrin figure" for flour based essentially on the *alpha*-amylase activity of the flour, as they claim that the results are of considerable value in predicting the behaviour of flour in certain baking processes.

Other investigations on the subject have been made by Onishchenko (*Biokhim Khlebopach*, 1938, 39) and Glazunov (*Biokhim*, 1939, 86) in Europe, and Stamberg and Bailey (*J. Biol. Chemistry*, **126**, 479) in U.S.A.

Dough Structure

Dough structure and its physical assessment continues to attract attention, and Munz and Brabender (*Cereal Chemistry*, **17**, 332), using the Brabender Extensograph, have indicated lines on which this instrument can predict baking flour. A particularly attractive piece of work is the study of the changes in dough which take place in baking, and which are recorded by means of an apparatus designed by Baker. Baker and his co-workers (*Cereal Chemistry*, **16**, 513, 517, and 682) heated dough by the passage of an alternating current between two electrodes. The voltage was regulated to a constant wattage and the temperature reached resembled those in the actual baking process. In this way, volume changes, pressures generated in the dough, conditions controlling oven spring, etc., were studied.

Analytical Methods

With respect to analytical methods, reference should be made to the determination of granularity by D. W. Kent-Jones, E. G. Richardson, and R. C. Spalding (*J. Soc. Chem. Ind.*, **58**, 261), as this method is simple, accurate, and goes a long way to solving this particular problem. The results obtained by the method are very illuminating and helpful to the practical miller and to the milling engineer.

A review of the more commonly used methods of analysis, such as moisture, ash, nitrogen, etc., has been made by M. Soenen and R. Pingnair (*Bull. École Meun. Belge*, 1939, **6**, 161), as a result of the work of a committee appointed by the Belgian millers to consider the possibility of more standardisation in this respect.

The various factors which influence the acidity of flour and methods for their determination has been the scope of a paper by Zeleny (*J. Ass. Off. Agric. Chem.*, **22**, 526). The acidity is caused by:

1. The phosphate in the flour;
2. The amino acids present; and
3. The fats or, rather, the decomposing fats.

The acidity due to fat is determined by titrating a petroleum extract, and an alcoholic extract of the residue gives the remaining total acidity. Extraction with water indicates the acidity due to phosphate.

Miscellaneous

C. R. Jones, of the Research Association of the British Millers (*Cereal Chemistry*, **17**, 133), has summarised the long and painstaking enquiry which has been made into starch damage in modern mills. It has long been known that different mills grinding similar wheats produce flours with varying diastatic capacity when submitted to fermentation processes, and no one has done more work on this intriguing point than the Research Association. Jones has emphasised that the mechanical damaging of starch in the milling process, which naturally varies from mill to mill according to the pressure used, type of roll surface, etc., is an important factor in the control of the diastatic activity of flour.

Bungenberg de Jong (*Chem. Weekbl.*, 1939, 400) has made an authoritative survey of the present knowledge of the colloidal chemistry of gluten, the effect of lecithin, etc., in contributing a paper to the protein symposium of the Dutch Chemical Society.

Reviews of the present knowledge or lack of knowledge concerning the staling of bread have not been uncommon in recent years, but that issued by Wm. Cathcart (*Cereal Chemistry*, **17**, 100) is worthy of attention to those whom the subject interests.

In view of the interest which will be taken in the next few months in vitamin B_1, it is important to note the work of A. S. Schulz, L. Aitkin, and C. N. Frey (*J. Amer. Chem. Soc.*, **59**, 2437, and *Cereal Chemistry*, **16**, 643), who have applied their fermentation method for determining B_1 on various flours and flour streams. With 73 per cent. extraction of flour, only 18 per cent. of the vitamin B_1 in wheat is found in the flour. Attention will doubtlessly be focussed on the thiochrome method of Wang and Harris for the determination of vitamin B_1 in flour and bread, and in this connection it is interesting to recall the paper by M. Pyke (*J. Soc. Chem. Ind.*, **58**, 338), who successfully applied the thiochrome test to flour and other foods after digestion with pepsin to destroy protein and taka-diastase to ensure the full liberation of the vitamin by the conversion of the co-carboxylase present.

Fortifying Flour

One of the important problems in the past year has been that of the fortifying of flour by the addition of vitamins and other substances. As, however, this has been discussed elsewhere in this issue, it is not proposed to deal with the matter in the present survey.

CORRESPONDENCE

Mr. William Banfield, J.P., M.P., writes about Some Problems of the Baking Industry.

The Editor.

DEAR SIR,

It is quite obvious that great changes are imminent so far as the manufacture of bread and flour confectionery is concerned. The statement made in the House of Commons by the Parliamentary Secretary to the Ministry of Food makes it clear that the Government intend to experiment with calcium salts and vitamin B_1. We must await the precise effect of this chemical process before passing final judgment. But I think it is absolutely necessary that whatever is added to the flour should be made quite clear to the baking industry so that the fermentation process may be adjusted accordingly. Otherwise, I can see far more harm than good being done.

At the same time a recommendation has been forwarded to the Food Controller by the Baking Trade Advisory Committee (set up under the Ministry of Food) limiting the shapes of bread and thereby cutting out what may be called unnecessary labour. On this point I do not think there is much ground for complaint. Provided the public are supplied with good wholesome bread, the particular shape of it does not appear to me to be of any importance during a period of war.

To me, however, the possibilities of the prohibition of night baking holds out more hope for the future of the baking industry. I have declared over and over again that the opposition to night baking from the smaller employers in the baking industry—who, after all, supply nearly two-thirds of the bread to the community—was nothing more than a tragedy for themselves. It would appear to anyone of reasonable intelligence that the smaller employer, baking his bread in the early morning and delivering it in his own neighbourhood, had everything to gain by the prohibition of night baking and nothing to lose. The factory-made bread is at least twelve hours old when delivered to the customer and very often nearly twenty-four hours old. The local baker, therefore, would have a very considerable advantage in day baking. It is, however, the stupid opposition of the smaller employers, led by the National Association of Master Bakers, which has simply played into the hands of the big firms. To-day it is true to say that the bigger the firm the more they are in favour of day baking. They no longer fear the opposition of the smaller men. They can so adjust their sales to-day that under a legal prohibition of night baking they can produce all their requirements, and even save money in the process, by cutting out heavy bills for lighting and by better and closer supervision.

(Continued on page 230)

SERVICE FOR BAKERS

Four companies producing margarine and cooking fats have combined their experimental departments in one organisation. Here is a description of how bakers are helped in all phases of their industry by "The Bakery Service".

Specially Contributed.

THE FORMATION of Marcom, Limited, which is now responsible for marketing all margarine and compound cooking fat, has affected the contacts of the individual companies hitherto selling these products. Several of these companies formerly made available to the trade their Service Bakery facilities, covering all phases of bakery production, giving advice, recipes and demonstrations and maintaining generally the forward movement of the bakery industry. Because they consider that the importance of this industry to the welfare of the nation demands the continuance of these facilities, four of the companies, whilst participating in the national production scheme, have decided to combine their Bakery Service and Research activities. The four companies are British Creameries, Ltd., Covo Refining Co., Ltd., Craigmillar Creamery Co., Ltd., and De Bruyn, Ltd., and the joint organisation is called "The Bakery Service".

Service to the Trade-User

This organisation is maintaining the same service to the trade-user as was formerly given by the individual companies. The withdrawal of branded margarines and speciality shortenings has already caused many bakers to ask for advice and alternative recipes. The Sugar Order restricting the use of sugar for decoration has similarly led many bakers to ask for information about obtaining an attractive cake without contravening the law. Happily, the combined resources of the Bakery Service have been equal to these tasks.

Service work and "trouble-shooting" is rendered very much easier by information already filed and by a wide experience of problems likely to be encountered. There is also an obvious economy in permitting experimental work on substitute-materials, etc., to be centralised rather than each baker making his individual tests. A great deal of time and material is saved, for even the largest bakeries are unlikely to have such experience and equipment as are available from the joint contributions of the four companies

Product-control operates on user-tests conducted under fixed conditions. A constant-temperature room is used for storing and testing all ingredients.

Laboratory Work

A small laboratory is necessary for work of this type because both experimental and service work frequently entails analysis or laboratory examination of ingredients, etc. Because of changes in formula, due to the use of substitute-materials, many bakers have experienced difficulty this summer with mould, and the laboratory has been of great help in dealing with this. From a national and a personal point of view mould is perhaps the most annoying form of waste and trade users have been assisted in overcoming a very expensive trouble.

Commercial bakery equipment is used for developing new and economical uses for raw materials, and this equipment ranges from a rolling pin to a fully-automatic doughnut machine, the latter being used for frying tests under large-scale conditions. Ovens and mixing machines are electric, while gas-operated refrigerators are used, and domestic gas cookers, with a full kitchen equipment, are available so that advantage may be taken of domestic experience in the production of "home-made" varieties.

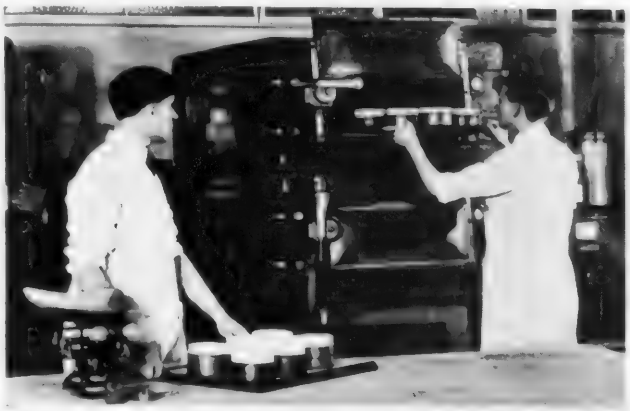
Full-Scale Testing

This commercial equipment is used, as far as possible, in service work in order to parallel actual bakery conditions, and bakers have complete confidence, therefore, that the recipes, etc., sent to them will work on full-scale commercial batches. In former times product-control formed part of the work, and this was based largely on user-tests. Laboratory examination was made at the factory, but the bakery control used practical tests such as the product would encounter in commercial use. Naturally, the conditions of these tests are carefully controlled, as the following description of the creaming-test shows. The amount of air which can be incorporated in the shortening plays a large part in determining the volume and structure of a cake, and the creaming qualities of the shortening of margarine are therefore of great importance. The shortening and sugar are stored with the equipment at 70° F. for 24 hours prior to the test. The weighed quantities of the ingredients are then subjected to a fixed creaming process, the density of the batter and its temperature being recorded at intervals. From this information the rate of air-absorption per lb. of fat can readily be calculated and its behaviour under commercial conditions predicted. The equipment for these tests is carefully standardised, and the work is done in an electrically controlled constant-temperature room.

Similar tests have been devised for measuring the egg-absorption of cake margarines and for estimating the quality of pastry-margarines and all the other products such as frying oil, margarine for ice-cream, etc. Where the product is intended for use under abnormal conditions, such as in hotter climates, the tests are suitably modified in order to allow for this.

The research work necessitates even greater control of conditions and ingredients, and considerable care is taken to ensure the reliability of the results. For example, in any baked goods, a considerable variation in appearance, volume and general quality can be caused by fluctuations in oven conditions. The Bakery Service uses a thermostatically-controlled electric oven, according to a fixed routine, which eliminates a great deal of the variations from this cause.

Improvement of the products and developments in the uses of the products are natural concomitants of the service work and, normally, a considerable time is spent on it. Both activities depend to a considerable extent on basic research into the why and the how of the behaviour of ingredients and final products. As far as possible the extent of basic research is being maintained despite the handicaps imposed by present conditions. Recent



Under commercial conditions, using full-scale equipment, new and economical uses for margarine and cooking fats are investigated.

inquiries into recipe-balance have produced information which has immediate value, in so far as it permits modifications in normal recipes to a more economical usage of sugar, eggs and shortening, without greatly affecting the quality of the final product. The importance of such discoveries to an industry rationed for these ingredients cannot be over-estimated.

Results of Recent Investigations

Recent investigations have been made into relationships of the milk, sugar and baking-powder quantities in cake batters. It has been found that the previously accepted "rules" for calculating these quantities are merely special cases of more general laws, and that it is possible to make cakes with quantities very different from those customarily used, without materially altering the cake. Briefly, it has been shown that increased liquid can be used if either or both the sugar and baking-powder are increased. Similarly, decreased sugar (with a fixed liquid quantity) demands increased baking-powder in order to maintain the cake structure.

To the layman such discoveries may at first sight appear to be of little importance, but the baker will appreciate that they will enable his recipes to be modified to use less sugar and therefore to give more weight and volume of cake from his limited supplies. Furthermore, the increased milk addition lowers the cost per pound of cake and produces a greater weight of batter per pound of the restricted supplies of whole egg, margarine and sugar. These increases in output are not insignificant and amount, for example, to 12½ to 15 per cent. in the case of a medium quality madeira cake. This would compensate for over half the cut in production due to the rationing of cooking fats

Comparative tests under rigidly controlled conditions are carried out to investigate the effect of varying quantities and qualities of ingredients.

and margarines, and this without marked deterioration in the final product.

The Bakery Service, therefore, despite the demands of National Service and the limitations of raw material control, is helping and will continue to help the food industry through a difficult period. The information and facilities of the organisaton are freely at the disposal of all who wish to use them.

SOME SUPPLIERS TO THE BAKERY SERVICE

Doughnut Machine: *The British Doughnut Co., Ltd.*
Ovens: *Peerless Electrical Manufacturing Co., Ltd.*; *General Electric Co., Ltd.*
Mixers: *Hobart Manufacturing Co., Ltd.*; *Peerless Electrical Manufacturing Co., Ltd.*
Laboratory Fittings: *Baird and Tatlock, Ltd.*
Constant Temperature Room: *Unity Heating, Ltd.*
Oven Thermostat: *Cambridge Instrument Co., Ltd.*
Refrigerators: *Electrolux, Ltd.*

WORKMEN'S COMPENSATION OR COMMON LAW DAMAGES

WHERE an employee suffers an injury in the course of his employment and becomes entitled to workmen's compensation, he might at the same time be entitled to damages at common law as against his own employer. This common law right will arise where the injury has been occasioned by the personal negligence or wilful act of the employer or of some person for whose acts or omissions the employer is responsible.

But in such cases section 29 of the Workmen's Compensation Act, 1925, provides that the employee must make his election between compensation under the Act, on the one hand, and common law damages on the other.

This statutory provision has given rise to a number of important decisions, and it will be the purport of this article to explain the present state of the law on this point.

In the first place, it is necessary to examine that line of decisions in which money is actually paid to and received by the employee.

Whatever might otherwise be the effect of a receipt of compensation or the employee's right to enforce his common law remedy of damages, it is open to the parties to agree that such receipt is not to prejudice any right which the employee may enjoy at common law, and is not, therefore, tantamount to an election. There is an early case where the employee refused to accept the money offered to him by his employers unless it was without prejudice to his other rights, and the employers assented to this course; it was held that there was an effective agreement between the parties which preserved the employee's common law rights, notwithstanding the receipt of compensation by him.

But, on the other hand, even if the employee, on the receipt of compensation, were to accept it "without prejudice" to his other rights, he would, nevertheless, be regarded as having made his election and as having accordingly lost his common law rights so long as his employer objected to the receipt of the compensation subject to such conditions. But the employer in such a case must object promptly, and, if he were to allow the employee's stipulation as to the receipt being without prejudice to pass unchallenged, he will be regarded as having implied assent thereto, and his employee in such a case would be entitled to pursue his common law remedies.

The employee, however, will not be regarded as having made a binding election unless the money which is paid to him is received by him as workmen's compensation. It is not sufficient for the employer merely to pay the money over to his employee as being such compensation.

This point is well illustrated by the recent case of Ullswater *v.* Elder Dempster Lines, Ltd. In this case the injured workman, as the court held, was not aware at the time of the receipt of the payments made to him by his employers that they were being paid as compensation which his employers were under a statutory obligation to pay him as compensation during incapacity occuring as the result of an accident in the course of his employment,

(*Continued on page 233*)

POTATO PRODUCTS

Four years ago a potato products factory was opened in Cambridgeshire, and it has been so successful as to encourage the Ministry of Food to plan the erection of at least five additional plants. The elaboration of the different products of the potato is described here.

Specially Contributed

WAR has given an impetus to the introduction of a new industry into this country—the manufacture of potato flour, farina and their products, dextrine and glucose. The production of such essential food has for over a century been an established practice on the Continent, particularly in Germany, where, prior to the war of 1914-1918, about 8,000 factories were engaged in this industry. Under the peace terms, however, Germany lost nearly one-half of her potato products factories, due to loss of territory. But her diminished output was soon more than balanced by her neighbours' increasing activities in this sphere, notably Holland, Italy, Poland and Russia. In Great Britain between 50,000 and 60,000 tons of these potato products are used annually, every ounce of which is imported; and it is doubtful whether this quantity could be produced here for some years to come, at least from home-grown potatoes, for prior to the present war we did not grow enough potatoes for direct table use, much less having any left over for industrial purposes.

The solution could not be permanently satisfactorily solved by importing potatoes for use in British factories, partly because two-thirds of the cargo would be useless water, and partly because the offal from the tubers could be more economically used up in the districts where the potatoes were grown—to put back into the soil the nutriment taken out—either directly as fertiliser or indirectly as cattle-food. At all potato-processing factories it is obviously necessary to carry large stocks of the tubers, and in the past this storage has led to considerable loss by decomposition, amounting in some cases to 50 per cent. of the stock. For example, the starch is slowly converted to sugar; carbon dioxide and water are also created, which is the so-called "breathing" of the tubers. In these circumstances as long as air can penetrate to every tuber no loss occurs; but, if ventilation is impeded, "sweating" takes place and the pile of potatoes begins to heat up. Under such conditions mould growth occurs, one of the most common moulds being *Phytophthora infestans*. One or two tubers infected with this will ruin several tons in the course of a month by converting them to a soft slimy mass, which is useless even for cattle-feeding.

Potato Flour

Potato flour is the *Kartoffelmehl* of the Germans, in whose country it forms a staple article of daily diet, being used chiefly in bread-making and for pastries. It is also known as potato meal and in the U.S.A. as potato flakes. Food experts say that its vitamin content and general nutritive value equals that of any cereal flour. Although in practice this value would fluctuate considerably, depending on its fibre content, the more fibre present, the higher the food value becomes. Conversely, the less fibre present, the higher the price becomes, and the so-called best grades of potato flour are little more than farina (potato starch). In several Continental countries two chief grades of potato flour are produced. For home consumption the product is invariably of a brownish-cream colour, because it contains the whole of the peel besides the starch fibre; while the quality for export contains no peel, but only starch fibre, and it is usually bleached and finely dressed until its appearance simulates closely an English wheat flour. The method of production is practically the same in either case. Cleansing of the potatoes is a very necessary preliminary, for any heterogeneous matter would spoil the processing; so that efficient washing machines—built specially for the job—are always used. For the same reason every washed tuber is examined before use. This is done by girls standing alongside a moving belt conveyor to throw out defective tubers. The potatoes are next steamed in an autoclave at a pressure of about two atmospheres, this giving a temperature high enough to sterilise them, after which they are converted to a coarse pulp by disintegrating machines. Drying of the pulp, down to about 14 per cent. moisture, may be done in various ways. The one giving the best finished appearance to the product is by steam-heated rotating drums, on the surface of which the wet pulp falls, to be removed in the required dry state by a scraper knife. Separation of the peel, when necessary, may be accomplished in sifting and dressing machines.

Farina

Farina, or potato starch, differs from potato meal in that it rarely contains more than a trace of fibre; and whereas the sterilisation of the meal is ensured by thermal means, which also gelatinises its starch, in farina manufacture the starch must not be gelatinised, so that chemical means have to be employed to prevent decomposition. The chemical agent most widely used is sulphur dioxide, either in the gaseous state or as aqueous solution, and it is applied to the starch liquor during processing. From the viewpoint of starch yield, probably the most important machinery used in farina production is the grinding machines for reducing the potatoes to a pulp, for unless the starch cells are thoroughly broken up by such mechanical means the starch cannot be isolated from the fibre. The reduction of the potatoes occurs in two stages. In the first they are torn to coarse fragments by being pressed against revolving serrated blades in a rasping machine. A pair of stones, either of the vertical or horizontal type, then reduces the coarse pulp to a much finer

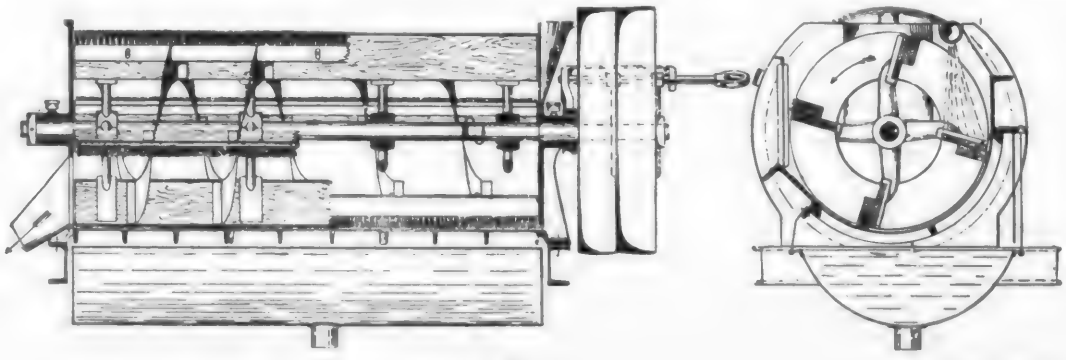


Fig. 1. [*F. Jahn and Co.*

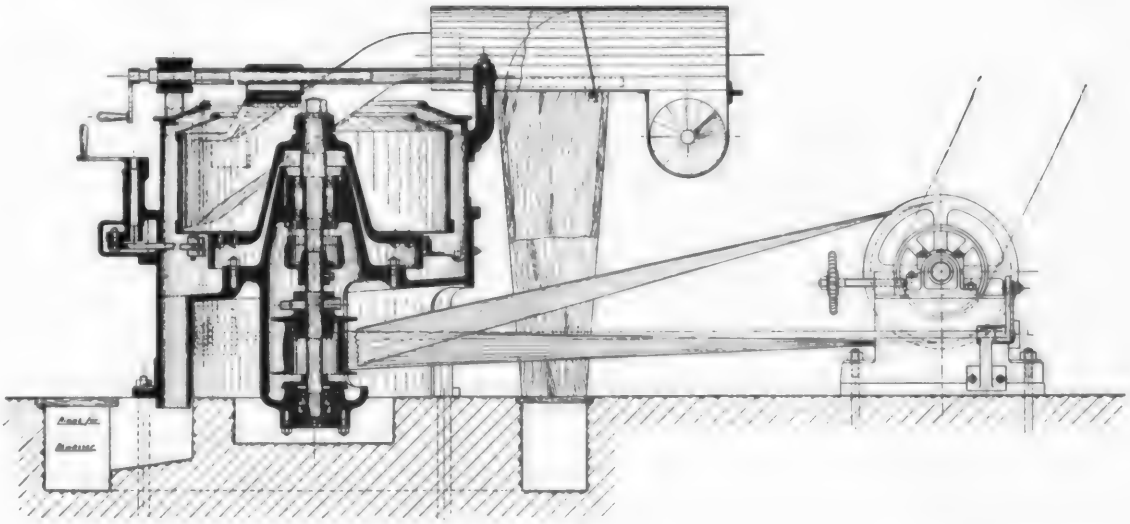


Fig. 2. [*F. Jahn and Co.*

condition, wherein the starch cells are completely broached, so that the starch can be separated by merely washing the pulp on suitable sieves, the latter to retain the fibre.

Starch Extraction

In practice the sieves may be of the reciprocating type or of the rotary pattern. One of the latter is illustrated in Fig. 1. The casing is generally of iron, carrying a series of steel frames covered with copper gauze, each frame having an area of about 2 square feet. As the pulp, mixed with water, is run into the machine it is caught by a number of baffle boards, which churn it up and expose every part to strong jets of water. On the boards is fixed a series of brushes, so adjusted to just make contact with the sieve surface, thus keeping the latter clear by removing the fibrous matter. The internal mechanism revolves at a speed of about 60 r.p.m., so that a fairly effective separation is obtained of fibre and starch in one passage through the machine. But even so the starch milk passing through the sieves still contains some fibre, and the fibre not passing through the sieves still contains some starch. It is the usual practice, therefore, to regrind the partially exhausted fibre in a stone mill and to put it again through the same type of extracting machine; while the starch milk from the first machine flows into another identical machine, but equipped with finer gauze, which retains the bulk of the residual fibre. This starch milk next passes into cement-lined brickwork or oak agitating vessels, wherein it is stirred up with sulphur dioxide before going to the dehydrating machines.

Dehydrating the Starch

Continental manufacturers of potato starch have long recognised that dehydration, or removal of water from the starch, can be done more cheaply within limits by mechanical than by thermal means, and they have displayed much ingenuity in designing a machine for this work. The type of centrifuge most commonly in use for this purpose is outlined in Fig. 2. It consists of a rotating drum, about 30 inches diameter to about 15 inches deep, the filtering surface of which is made up of perforated bronze covered with filter-cloth. The drum has suitable bearings in the centre and is anchored at both top and bottom, the spindle running in ball-bearings, and, as the brake operates on the base of the drum itself, the spindle is not affected by its sudden application. An automatic discharging device is fitted, consisting of a chute dipping into the revolving drum. When a lever is operated, the layer of starch in the drum is diverted and passes up the chute into the discharge T-shaped trough at the side of the machine, from whence it is carried off by a spiral conveyor. In the centre of the T crosspiece is a trap door, and, by opening this and operating another lever, any fibrous layer of starch deposited in the drum may be removed and diverted back to the grinding machines and extractors. The outlet for the starch-free water is seen in the bottom left corner of the machine. Because of the self-discharging device, one man can attend to six or more machines, output is increased and power is saved because continual starting and stopping is unnecessary, while the filter cloth has a longer life, for the automatic device does not damage it to the same extent as the human agency in getting out the starch. A machine of this type dehydrates the starch down to between 38 and 40 per cent. water. It then needs to be dried down to about 15 per cent. in some type of thermal dryer. The various types of starch dryer are well known in this country and call for no special comment here. The dried potato starch is in the form of a coarse cream-coloured powder. It may be used in this state for many purposes, but that exported from the Continent has been put through dry grinding and sifting machines equipped with fine silk gauze, which gives it that fine lustrous appearance we know in this country.

Potato Dextrine

The bulk of dextrine used in European countries has its origin in potato starch. It is a product intermediate between starch and glucose, and most commercial samples contain both starch and glucose. The time-honoured method of producing dextrine was to roast coarse farina at a temperature of between 230° and 250° C., which brought about the necessary modification in the starch within two to three hours. Early in the present century the practice of acidifying the starch with an acid—such as hydrochloric acid—before roasting became general. This preliminary impregnation with acid enabled the starch to be converted to dextrine at a lower temperature and shorter time—about 160° C. and one hour respectively—giving a practically white product as compared with a brownish-coloured material at the higher roasting temperature. Such a simple improvement in manufacture increased the scope for the use of dextrine in many different foodstuffs, for previously its dark colour inhibited its use in numerous directions.

At the present time there is a definite trend towards the use of a more expeditious method of dextrine making, but one which, simultaneously, requires more accurate supervision than does the roasting process. This new process consists of first acidifying the starch powder—as in the older method—and allowing the impregnated powder to remain a few days so that the acid may partly modify the starch before it becomes gelatinised by heat. The acidified powder is then mixed with cold water to form a thick starch milk, which is next heated for a short time under a pressure of about one atmosphere. The pressure is then released and the vessel's contents run on to a bronze-surfaced steam-heated roller or pair of rollers, in much the same way as potato meal is produced.

A dextrine made in this way has a colour equal to farina and decidedly superior to the colour obtained by the roasting method. For in the latter it is difficult to ensure a uniform temperature for every particle of powder, no matter how efficient the plant may be, and some portion becomes brown before others are dextrinised. But when the starch is in liquor form the danger of local overheating is not so great and a better colour results. It will be obvious that this modern method of dextrinising starch is less costly and quicker than the roasting process, for in the latter the product cakes together while roasting and has to be ground and sifted to render it marketable, whereas the material coming from the heated rollers is in the form of minute flakes of

good appearance and lustre, and only requires dressing when a specially fine powder is needed.

Whatever method is chosen for the manufacture of dextrine, it is one of the most difficult products to obtain with a predetermined composition. In the roasting method the initial moisture content and the presence of mineral salts in the starch affect the rate of degradation to dextrine; generally both excessive moisture and mineral salts tend to accelerate the reaction and to give an excess of sugar in the dextrine. While in the new method good judgment is required to stop the heating of the liquor at the right moment and to get it from the autoclave on to the rollers before hydrolysis has gone too far and a batch of glucose has been fortuitously made. Another type of dextrine goes under the name of crystal gum or British gum, due to its close resemblance to a natural gum. It is obtained by separating the unconverted starch and also the sugar from a dextrine solution by regulation of temperature, followed by filtration. The gum results from the evaporation of the dextrine portion to a thick consistency after decolorisation with activated carbon.

Potato Glucose

The greater portion of glucose produced from potatoes is in the form of syrup, and for this grade the potato pulp can be used direct; but for the high purity sugar known as crystal glucose it is necessary to use starch, because the high proportion of impurities in the pulp prevents the crystallisation of the sugar. When crystal sugar is required it is customary to use the starch milk direct from the sieves in the starch factory. This starch liquor can be bought at approximately half the price of the finished starch, based on actual starch content, and there would be no point in the glucose maker buying dry starch at a much higher figure and making up his own liquor from it. For both types of glucose the processing is much the same, consisting of hydrolysing the pulp, or starch, under a pressure of two to three atmospheres—the higher pressure being used for pulp—in the presence of a small percentage of hydrochloric acid. The resulting weak sugar liquor is next neutralised with soda ash, thus creating a small proportion of common salt within the liquor, which is regarded as beneficial. Decolorisation with activated carbon follows, then evaporation to the desired consistency. For glucose syrup the evaporator is arranged to give a liquor of about 1·490 specific gravity, while a liquor for crystallisation is evaporated to about 1·370 specific gravity. The latter liquor runs direct from the evaporator into crystallising pans, in which it is cooled to between 30° and 35° C., a few "seed" crystals being added to facilitate crystallisation. That portion not crystallising out—the so-called "mother liquor"—is accumulated until sufficient is on hand for further evaporation to make glucose syrup. The successful evaporation of glucose liquors at one time caused a great deal of concern in the factory, generally through badly designed plant, and liquor used to burn on the evaporator tubes, resulting in discoloured products. In recent years, however, chemical engineers have devoted much study to this problem, and several British firms now build evaporators which are used in practically every country in the world. A typical example is one designed to work on the film principle of evaporation, in which a series of evaporator tubes about 23 feet long are jacketed by steam tubes. The weak glucose liquor is fed to the plant from a tank about 3 feet above the bottom tube plate, the tank contents being preheated by the spent steam of the evaporator. As the glucose liquor enters the evaporating tubes, ebullition at once takes place inside, releasing a volume of vapour, which finds its way to a region of lower pressure higher up the tubes. In ascending the tubes the vapour forms a core in the centre of each tube, carrying up the liquid sugar as a film round the surface of the heating tube, this water vapour passing at a higher velocity than the sugar liquor. On reaching the top of the tubes the vapour and the liquor are diverted to the down tubes, in which a similar action takes place. When the separator is reached, the liquor is thrown down, while the water vapour escapes to atmosphere.

Potato Products in Food

Potato meal alone will make both bread and pastries of a characteristic flavour and with what we should regard in England as very poor quality. Bread made from the meal alone has a dirty brownish appearance, and is known in Germany as *Schwarzbrot* (black bread). Farina can form the basis of blancmange powders and similar edible powders in which, normally, cereal starches are used. A mixture of meal and farina can be processed and flaked to form an appetising breakfast dish by merely adding milk. Both of them may be used in making up custard powders, ice-cream, etc., while the meal alone makes a cheap adulterant for wheat flour. Incidentally, potato meal does not give a good mixture with English wheat flour, since the latter is already of a soft nature and a poor colour; but the meal makes an excellent flour when mixed—one of meal to three of flour—with wheat flours from countries like Canada and Russia.

Dextrine in Confectionery

Potato dextrine has important uses in the sugar confectionery trades. In these trades it is often desirable to have a cheap filler for boiled sweets and toffee. Ordinary starch cannot be used for this purpose, but the dextrine—due to its solubility—readily mixes with the other ingredients of the boiling-pan. In this connection it may be noted that when dextrine is included in a toffee recipe, for example, quite a good proportion of glucose is produced from the dextrine during the boiling of the toffee, because the other ingredients of the pan are mostly of an acid nature, and this acid is sufficient to produce some sugar from the dextrine. The boiled sweets manufacturer thus reduces his glucose bill by using the cheaper product dextrine. Gum benzoin dissolved in alcohol has long been used for glazing high-class chocolates and similar goods, but the same result is now being obtained with that class of dextrine known as crystal gum dissolved in water, which represents an appreciable saving. The wide use of glucose in the confectionery trades is well known. In recent years it has been dyed, flavoured and labelled "artificial honey", and from the chemical viewpoint it simulates honey very closely, having the same good nutritive value, so that the practice cannot be regarded as objectionable. The use of glucose in admixture with dark treacle makes a light yellow table syrup without the cost of bleaching the treacle, and here again the food value is enhanced by using the glucose. Caramel can be made by heating crystal glucose, although as yet cane sugar is cheaper for this particular purpose; but crystal glucose will no doubt fall in price considerably with increased production. Caramel is used as a harmless colouring material in a great variety of edible products.

Paper from Potatoes

Before concluding this very brief review of the potato products industry it may be mentioned that the Germans now have daily newspapers the paper of which is made from potato leaves, and 35 per cent. of the total German paper production comes from this one source. They also produce 150,000 tons (not gallons) of power alcohol for their war machine each year from potatoes. In May, 1940, the weekly ration of potatoes for ordinary domestic consumption was reduced to 4 ounces per person, to enable a greater proportion to be devoted to the manufacture of potato products.

Correspondence

(*Continued from page 225*)

There can be but little doubt that as the war goes on there will be no alternative but to prohibit night baking. Already employers in towns like Coventry and Bristol have stopped night baking and have no reason to complain of the result. The Bournemouth Master Bakers have petitioned the Government to prohibit night baking, while the Manchester Baking Industry, Ltd., has recommended to its members that no baking be done between 10 p.m. and 5 a.m. The frequency of night air raids has already led to a waste of material which the country can ill afford. The Blackout Order makes ventilation extremely difficult and imposes intolerable hardship upon the men employed. All these factors will, in my opinion, culminate in an order prohibiting night baking.

Yours faithfully,

WM. BANFIELD, J.P., M.P.,

General Secretary, Amalgamated Union of Operative Bakers, Confectioners, and Allied Workers of Great Britain and Ireland.

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Copies of the comprehensive 6-page index to last year's issues are still available to subscribers, who should apply to:

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THE HERRING INDUSTRY IN WAR-TIME

How the herring fisheries are affected by the war; the different methods employed in fishing; and the elaboration of by-products are discussed in this article by

J. F. MORSE

IN TIME of war the paramount importance of the nation's food supply is vividly realised by every responsible citizen. When reviewing our natural resources the advantage of Britain's ancient herring fishing industry cannot be overemphasised, since at practically all seasons of the year the fish may be taken off our coasts. The herring, being a rich source of protein, fat, and vitamins A and D, is a valuable addition to the diet; it is appetising and cheap. What effect will war conditions have on the herring fishing industry and the possibility of securing and utilising this immense potential food reserve in our waters?

Distribution of Herring

Herring fishing is distributed all round our coasts (the publication, *The New Herring Book*,[1] issued by the Herring Industry Board, contains a useful map, showing this distribution), and up to now the most important fisheries have been off the eastern shores. Commencing towards the end of April, off the Shetland Isles, the fishing gradually moves southwards down the east and west coasts until in December and January herring are taken in the Channel. This sequence of fishing led to the "Arctic Migration" theory being put forward in the sixteenth century. As elaborated by William Camden in 1607, the herrings left the arctic regions in spring, and travelled round these islands to return north again via Ireland. Later it was suggested that the herrings spent a winter in deep water off Yarmouth before continuing their journey. Similar additions were made from time to time, and subsequently this theory became very widespread; indeed, many believe it to-day.

The German scientist Bloch in 1783 was the first to question it, and now the "Arctic Migration" theory is discredited by scientific men. Since the eggs of the herring sink on to the sea bottom (unlike the eggs of most food fishes) and the young hatch out on the spawning beds, it is now generally agreed that the herring grows, becomes mature, and spawns close to the place where it was born. Any migration herring may make is usually after a plentiful food supply or a suitable spawning bed. Thus the varying character of the fish taken from different localities is explained, since the fish may be regarded as separate families living under dissimilar conditions, and feeding on different small floating organisms of animal and plant origin, known as Plankton. These independent colonies of herring are of prime importance as they ensure a continuous fishing, since a possible disaster to the fish at any point on the coast would be of local consequence only. If the "Arctic Migration" theory were correct such a catastrophe would be grave indeed, for the destruction of the migrating herring would seriously curtail the subsequent fishing.

Restriction of Fishing

Prior to 1914, about 75 per cent. of the East Coast herring catch was cured and exported to Russia and Germany. These countries have since developed their own fishing industries, and most of the herring now caught is consumed in this country. Relieved of these markets, catches have been restricted, and in recent years the East Coast herring industry has not been prosperous.

It is no secret that a wide mine belt protects our eastern seaboard, and consequently restricts the movements of the fishing fleets. Germany's newly acquired bases along the Dutch, Belgian and French coasts are an added menace. Naval and air protection given to the fishing fleets would otherwise be well utilised could the fishing be carried out safely in other waters. Attempted invasion, air, naval or military action on the East Coast will in no way affect the sequence of fishing elsewhere, and there is no reason to suppose that all possible requirements cannot be obtained from the West Coast should fishing in the east be suspended.

The fishing off the West Coast of Scotland has not been highly organised and exploited, but it is capable of rapid expansion. The type of fish and the methods of capture naturally differ from those of the East Coast, and it will be of interest to compare the two.

Comparison of Fishing Methods

Drift net fishing is employed on the East Coast, and Fig. 1, due to Norman,[2] shows the basic principle of this method. The fishing vessels adopting it are termed "Drifters", since after the nets have been cast the boats drift quietly with the tide. The string of nets hangs vertically from the surface of the water for about 30 ft., and from 80 to 120 nets may be employed, extending for 2 to 3 miles. Perhaps the American term of Gill net is more expressive, as it well describes the mode of action. The mesh of the net is such that a herring may push its head through, but not its broad shoulders. The gill covers effectively prevent the head from being withdrawn, and as the nets are hauled the fish are shaken out into the hold of the boat.

The shoals are composed of fish that are preparing to breed, and usually the members are approximately of the same age and size. The size of the shoal varies greatly; it may cover an area of 6 sq. miles; not infrequently a huge shoal measuring about 8 to 9 miles by 4 to 5 miles wide may be encountered. The movement of the shoal is guided by the search for food and a suitable spawning bed. When these large shoals of fish and modern fishing technique are considered, it is not surprising that gluts occasionally occur.

Fish Gluts

Much has been said and written of the vast quantities of dead herring which have been thrown back into the sea, and on every occasion the same question is raised: "Why are these herrings not utilised?" It is most unlikely that dumping will occur during any of the restricted East Coast fishing, and certainly not on the West Coast, for the method of fishing can be more easily controlled and again such vast shoals are not encountered. In considering the question in its broadest aspects, it should be realised that the amount of herring dumped does not usually exceed ½ per cent. of the total catch. Often the fish are of unsuitable size or quality, while, again, market conditions may be such that curers will not buy for fear of loss. All too frequently, however, excellent fish have been thrown away since supply has exceeded demand, and no personnel or equipment have been available for dealing with them. It is fairly obvious that there is no simple solution to the difficulty, and the only consolation is that it is not likely to occur during the time of hostilities.

Seine Net Fishing

On the West Coast, Seine net fishing is followed in the lochs, and it is from this comparatively unexploited region that suffi-

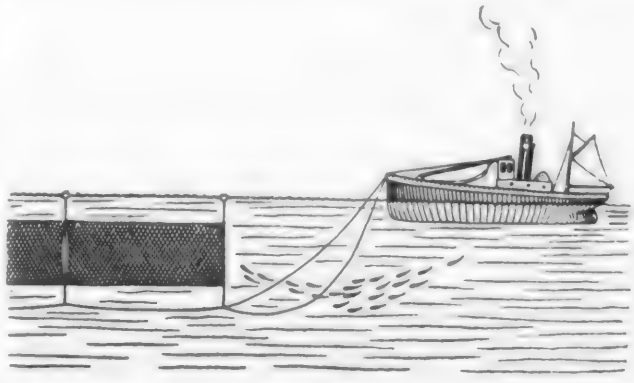

Fig. 1.—Steam Drifter Fishing.

From *A History of Fishes* (Norman). *Courtesy Ernest Benn, Ltd.*

cient herrings may be expected during the long season from June to January. The Seine net is handled in quite a different manner from the drift net, and Fig. 2 shows the basis of the process. The net is fished in open water, two boats taking part. While one remains at rest the other pays out the net in a circle; alternatively each boat may cast half the net and complete a semi-circle. When the two ends of the net have been brought together it is hauled in, the construction being such that the fish are prevented from escaping through the bottom. This process is continued until sufficient fish have been obtained.

It has been mentioned that the primary cause of shoaling in the East Coast area is a preliminary to breeding, and that the fish comprising the shoal are usually similar in size, condition, etc. On the West Coast the loch fishing is provided by herring who have gone there in search of food, and it naturally follows that the fish are very mixed. Indeed, this is one of the principal reasons why this fishing has remained comparatively undeveloped, for a buyer cannot be sure of the size and quality of the fish from any one boat. Summarising, it may be said that fishing on the West Coast of Scotland yields a product less standardised than that obtained from the East Coast. The Seine net method of fishing is more controlled than is drifting, and the catches to be obtained should be ample for all purposes, provided, of course, that equipment and technique of disposal is organised.

Maximum Utilisation of Catch

The maximum utilisation of the catch is particularly important in time of war, and much remains to be done in this respect. In considering the question, the form in which the herring enters commerce, and the portions removed may be conveniently set out as follows:

Product.	*Preparation.*	*Waste Before Reaching Consumer.*
Bloatered	Head and gut removed. Fish brined and smoked over wood fires. Bloaters should always contain a roe	Head and gut
Canned	Head and gut removed and sometimes scales. Brined and preserved in cans, usually with tomato	Head and gut, sometimes scales.
Cured	Fish mixed with salt during unloading. Gills and gut removed. Fish packed in salt	Gills and gut (mixed with salt)
Fresh	Packed in ice	None
Kippered	Head and gut removed. Fish split down back, brined and smoked	Head and gut

Of the waste the gills and gut from cured herring have predominated in the past. This material finds use as a fertiliser for crops which will tolerate salt, and the bulk of it is disposed of in this way. Attempts to desalt the offal have not been very successful as most of the oil is lost in the process, and, after drying, little appeared to be left other than the gills. As the demand for cured herring has steadily declined, so the available quantity of this offal has decreased. Otherwise it would be well worth while mixing the fish in salt after "gipping", thus making available salt-free material which could be worked up for edible fish meal.

Utilisation of Offal

The offal from canneries and kipperers is suitable material for the production of herring meal and oil. Briefly, the process consists of drying the offal, extracting the oil and grinding the residual meal. Each stage has its own problems, and to produce a uniform first-class material is by no means an easy matter.

Very oily material renders drying particularly difficult, and this is sometimes overcome by a preliminary pressing to remove as much oil and water as possible. Indeed, this is the only treatment some offal receives, the expressed oil being settled in tanks and the press cake disposed of as manure. The high residual oil content renders it unsuitable for feeding purposes, while the absence of salt extends its use for agriculture.

To avoid the preliminary pressing, some factories add white fish offal to their herring residues. Diluted in this way the material dries well and gives a superior meal. Obviously this method can only be practised where supplies of white offal are available.

For feeding purposes the presence of fish oil is regarded as objectionable. It is claimed that eggs, milk, and products therefrom taste fishy if the animals concerned have been feeding on herring meal containing too much oil. Probably the "personal factor" enters into the question, but the fact remains; the lower the oil content the higher the price. From 3 to 4 per cent. must be regarded as the maximum permissible content for a feeding meal made from herring offal, and such a figure is obtained by solvent extraction. When free from oil the meal is ground and screened. Fish meals are sold on analysis.

The herring oil obtained after the evaporation and recovery of the solvent is settled in tanks, and the clear oil drawn off into barrels. Its uses in industry are varied. As an ingredient in varnishes and lacquers it assists to produce films of remarkable flexibility. First-class soaps may be prepared from fish oil, while it is also employed in leather dressing, the manufacture of linoleum, and the tempering of steel.

Pearl Essence

Attempts have been made in this country to produce a particularly interesting by-product from the herring. Pearl Essence is the name given to a suspension of "Fish Silver" in a suitable vehicle, and, as its name suggests, it is used largely for the manufacture of artificial pearls and as an ingredient in modern transparent lacquers and plastics. These preparations have been widely employed, particularly for toilet purposes where they have been used for the backs of hair brushes, combs, handles of manicure instruments, nail varnishes, etc. Small pieces of delicate furniture may also receive a final coat of pearl lacquer. Hitherto a continental industry, there is no technical reason why it should not be established here, as the herring yields material quite suitable for the purpose. Chemically, "Fish Silver" is crystalline guanin, a substance produced by many animals and fishes. Frequently, however, the guanin occurs in its amorphous form, and in this state it is quite useless for pearl essence. Long, blade-shaped crystals (Fig. 3) are necessary to produce the lustrous

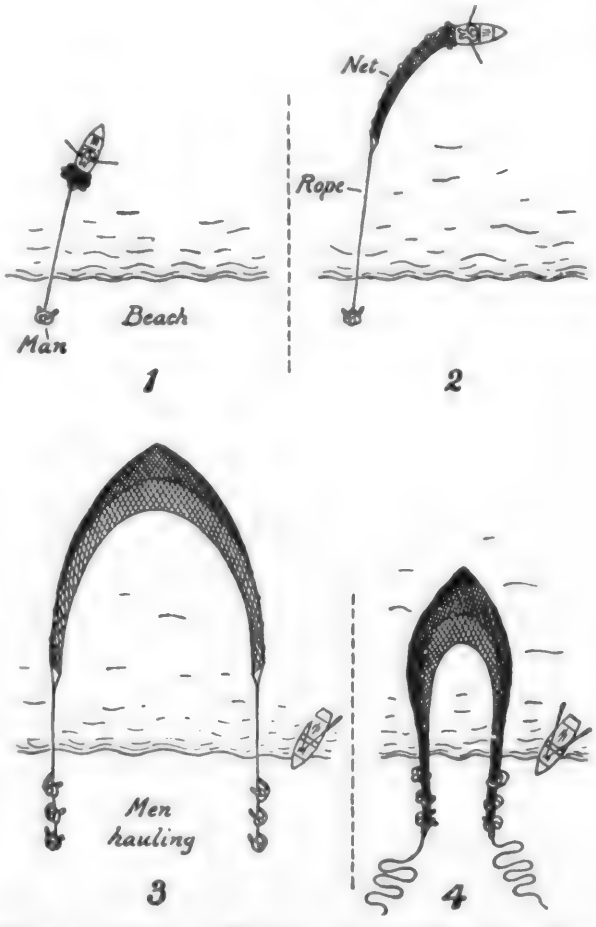

Fig. 2.—Diagram to illustrate the principle of working a Seine Net from the shore (seen in plan).

From *A History of Fishes* (Norman). *Courtesy Ernest Benn, Ltd.*

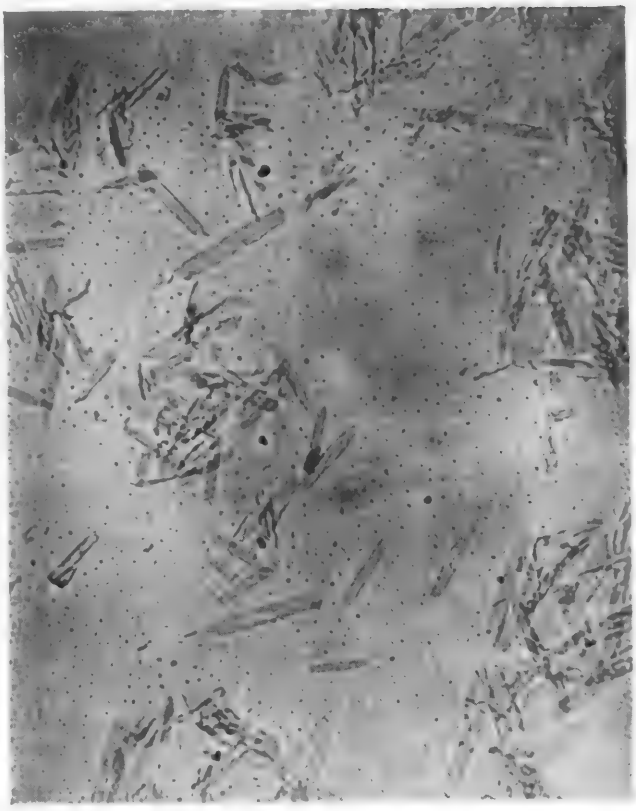

Fig. 3.—" Pearl Essence ". Guanin Crystals x 400 diameters.

From *U.S. Bureau of Fisheries.* Document 989.

effect, which has been well described by Taylor[3] as follows: "To understand the beautiful and peculiar appearance of pearl essence, one may visualise very thin light blades, floating in a liquid and turning over and over like narrow strips of paper falling in air, their narrow surfaces throwing brilliant flashes of light in all directions and at the same time giving a play of colours like soap bubbles do. The light coming from them is doubly refracted and polarised, and when it passes successively through two of these crystals it is broken into colours by a twisting of the polarised beam."

The crystalline guanin of the herring is to be found adhering to the scales on the underside of the fish. For the production of pearl essence, the fish are scaled and the scales agitated with water to detach the guanin crystals. The extracted scales are then removed by straining, and the guanin suspension run into a container to settle. The sludge so obtained may be treated by one of several methods, the most interesting of which utilises the property possessed by guanin crystals of being more readily wetted by certain organic liquids than by water. On agitation with one of these liquids (ether, xylol, carbon tetrachloride, etc.) the sludge yields its crystals of guanin which are further purified by subsequent sedimentations and washing with fresh fat-free solvent. Finally, the guanin is incorporated with the vehicle in which it is to be used.

With true oriental ingenuity, Kosaku Murakami[4] has patented the use of dried fish eyes as the basis of artificial pearls, thus rendering them almost entirely of marine origin. The dried eyes of the herring, however, would be too small for this purpose.

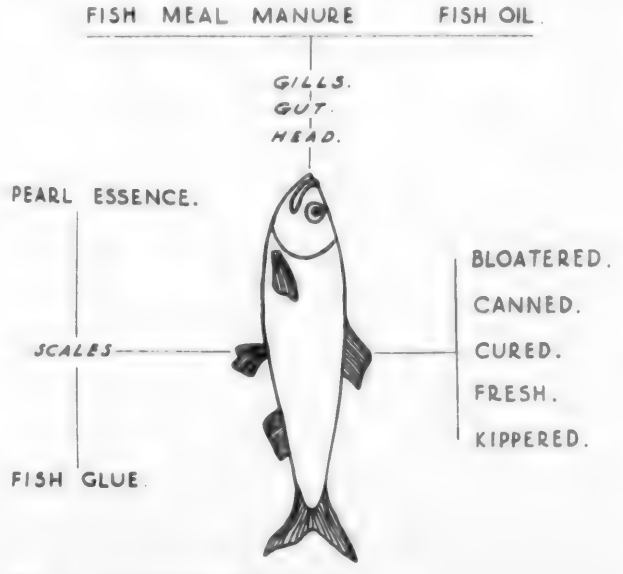

Fig. 4.—Utilisation of the Herring.

Fish Glue

The scales remaining after the extraction of the guanin provide excellent material for the production of first-class fish glue. As obtained the scales are clean, free from salt, etc.; the process necessary for their conversion to fish glue is comparatively simple. It consists essentially of hydrolysis with dilute acetic acid.

Thus, the utilisation of the herring may be almost complete (Fig. 4). Indeed, entirely so if the consumer in his enthusiastic digging for victory will incorporate the offal, backbone and tail with his land. In practice, much remains to be done. Organisation and co-operation within the industry needs to be developed, and then perhaps the stimulus of war and Government initiative will create an industry of which Britain may well be proud.

REFERENCES

[1] The Herring Industry Board, 184, Strand, W.C. 2, *The New Herring Book.*
[2] Norman, *A History of Fishes.* 1931.
[3] Harden F. Taylor, *Pearl Essence: Its History, Chemistry and Technology.* U.S. Bureau of Fisheries, Document No. 989. 1925.
[4] British Patent 152,914. 1920.

Workmen's Compensation

(*Continued from page 227*)

and, although the workman knew that the payments were in the nature of some sort of compensation, the court came to the conclusion that they had not been received by him as workmen's compensation, and that accordingly he was not debarred from pursuing his common law remedies.

The employee, therefore, having regard to the above authorities, is entitled to exercise his election

(i) Where he has not received any payments at all from his employer;

(ii) Where, if any payments have been made to him as compensation, he has, nevertheless, not been aware that they were made to him as such, so that there has been no receipt by him of the payments as workmen's compensation; or

(iii) Where, notwithstanding that sums have been both paid to and received by him as workmen's compensation, it has, nevertheless, been expressly or implicatively agreed between the parties that the employee's common law rights for damages are to be kept alive.

But payment or receipt of any sums as workmen's compensation without any agreement to preserve the common law rights will effectively preclude the employee from pursuing any other remedies against his employer, and in such a case it is immaterial whether the employee has in the first instance asked for payment of compensation or whether his employers have taken the initiative themselves and have paid the compensation without any prior request therefor on the part of the employee. It will then be too late for the employee to attempt to preserve his common law rights by any such statements that the sums have been or will in future only be received " without prejudice " to his common law rights.

In conclusion, it may be useful to point out that, in cases where no payment has actually been made to the employee, the employee will not be regarded as having made his election merely by instituting proceedings under the Workmen's Compensation Act or by bringing an action for damages, as the case might be. He might retract while he is in midstream, as it were. He might discontinue the proceedings under the Act before an award is made and bring an action for damages at common law, or he might discontinue his action for damages before judgment and institute proceedings for compensation under the Act, without forfeiting his right to make his election.

BOOK REVIEWS

Science in War. *Penguin Books, Ltd. Pp.* 140. 6*d.*

This book is a courageous and outspoken attempt to present to the public an account of the resources which the advances of science have made available since, roughly, the last war. It is true, as the publishers' note says, that "the full use of our scientific resources is essential if we are to win the war. To-day they are being only half used". The publishers were so much impressed (or depressed?) by the half-hearted use of science in the British war effort that they offered to bring out this book. It has been written by twenty-five scientists, all of whom are anonymous, and for all of whom the cover of the book claims that they speak with authority in their own fields.

Twenty-five separate links, however weighty, do not make a chain. It is a weakness, and may be a fundamental one, of the book that it offers good criticism and many suggestions with but few connected ideas. What the authors say about the neglect of science by classically minded administrators is unfortunately all too true, and a dictator who read the book and proceeded to act upon its suggestions would do good.

The idea of the distribution of vitaminised and mineralised biscuits could be adopted by any power that is, provided that he were cognisant of recent technological advances in the sphere of accessory foodstuffs. He would not have to be a scientist. Such a wholesale distribution would, however, be a blunderbuss device; it might be very effective in the event, but to use it would not be to apply scientific method. It would be scientific only to the extent that it was concerned with technological products. One might as well claim that a pianist is well disposed towards science just because he makes implicit use of a great deal of metallurgical science involved in preparing the steel strings of his piano.

The recurring complaint of the twenty-five authors is that where technology can help in war it is not being properly or fully applied: there is considerable neglect to use scientific resources. It appears as if none of the twenty-five can do much more than point out unused or possible applications in his own sphere. There is no synthesis, and there is only the shadow of a demand for the application of scientific method to public affairs. The authors would like to see more and better pianos, but they have not made up their mind about the performance, beyond agreeing that it should have a martial theme. The book's proposals for the application of science refer to the technology of things. Some of the proposals in the book are disparate even when dealing with the subject of increased food production by the use of fertilisers. Two authors pin their faith to nitrogen and continuous or intensive cropping; another to phosphate and rotation; and other ideas are of doubtful value, as is that of the animal husbandman who hopefully repeats that there are some animals which will eat seaweed; he evidently thinks that something ought to be done about it.

The scientists who contributed to this book appear to have offered themselves as hostages to the classically minded administrator. They deal in processes and things rather than with methods. But because the administrator is equally unaware of the potentialities of scientific method—as distinct from technological advances—he will probably ignore the suggestions as being just another plan. And so long as scientists are content to set down plans *ad hoc*, just as anybody else does, so long will it be difficult to convince the administrators that the scientists' way is better than any other. Lacking scientific method, the scientists' way exemplified in this book necessarily makes a poor showing. It is distinguished from the old way not in kind but merely in degree of awareness of technical achievements. To have the book is good, but is not inspiring.

It is noteworthy that the food problems considered centre around food production and vitamins. The section on communal feeding gives an idea for a brave new world, but about food processing before cooking practically nothing is said, except some grumbles about flour and about vitamins in margarine. Does this imply that no scientist concerned with food manufacture was among the twenty-five, or does it mean that food manufacture is not yet sufficiently scientific to be worth mentioning in this laudatory conspectus of science?

H. N.

The Manufacture of Compressed Yeast. F. G. Walter, A.A.C.I. Pp. viii + 254. 15*s.* net.

The story of fermentation is a familiar one, but it is, perhaps, with increased admiration for the work of Schwann, La Tour, Kutzing and Pasteur that it is realised that, although it was known to the ancients, it was not until the beginning of the nineteenth century, mainly between 1830 and 1840, that it was recognised that it was due to the presence of living cells.

Plimmer mentions that "Pasteur, in his contention that life was necessary for fermentation, was opposed by Liebig, who, without clearly stating his ideas, was of the opinion that there was something in the yeast cell which actually produced the fermentation. Traube in 1858 clearly stated the position that the yeast cell contained a soluble ferment to which decomposition was due. On account of the confusion of ideas it was suggested by Kuhne in 1878 that the soluble ferment should be termed enzyme, which signifies that 'something' in yeast which causes the fermentation of sugar.

"Not until 1807 was it definitely shown by Buchner that yeast did contain an enzyme which fermented sugar in the absence of living cells, and later it was shown that other cells and bacteria also contained soluble ferments. The term 'enzyme' is now used for the active agent in all cases, and the term 'fermentation' for the process of decomposition".

As the author of this excellent book on compressed yeast manufacture states: "In view of the importance of the subject, it is strange that the investigator finds little mention of yeast production in our literature, and, in contributing to a desideratum previously unsupplied, his book presents a comprehensive description of the various processes applied in yeast cultivation.

"It was further research following on the researches of Pasteur which proved that alcohol production was not essential to yeast growth, and many workers toiled incessantly to apply Pasteur's discoveries in the development of non-alcoholic processes of yeast cultivation, and, as a result, yeast alone now forms the basis of vast and rapidly expanding industries in which possibilities exist that are unknown to many, even to those engaged in the allied fermentation and cereal industries."

The first chapter discusses the yeasts, moulds and bacteria concerned in fermentation; the action of enzymes is briefly covered, as well as brewing materials.

Very clear directions, which should form a useful introduction to the subject, are given for the isolation of yeast pure cultures.

In the production of compressed yeast there are two starting-points—the pure culture flask supplying the yeast and the grist mill preparing the grain to nourish the yeast. The isolation and cultivation of a suitable seed yeast are as essential in yeast production as the careful selection of seed wheat is in agriculture, and for the same reason. Eminently practical instructions are given for the selection of raw materials for mashing, and a whole chapter is devoted to the differential fermentation of a grain brew. The theory of the differential principle of yeast nourishment was first applied, with indifferent results, in efforts to obtain higher yields of yeast and alcohol from strong spirit brews, but eventually the increasing demand for compressed yeast exceeded production from fermented distillery and vinegar brewery worts, and the principle was combined with Pasteur's discovery of the effect of abundant aeration upon fermenting yeast and applied to the production of yeast from extremely dilute worts. The term "differential" thus lost its original fermentative significance, but survived to indicate the evolution of the process.

Fermentation control is described throughout its hourly progress in a manner demonstrating the practical knowledge of the author.

In the chapter on compressed yeast production from molasses and inorganic nitrogen, the author recalls Pasteur's memorable controversy with Liebig with reference to the nourishment and propagation of yeast in pure cane-sugar solutions with ammonia as the only source of nitrogen, and mentions Dr. Lange's success in practically doubling the yields obtained in yeast factories. Instructions are given for the preparation of yeast from starch sugar brews and from spirit fermentations, and the other chapters discuss dried yeast, yeast foods, the final one giving an excellent description of the lay-out of a yeast factory.

NEWS FROM THE INDUSTRY

Wholemeal Bread

"There have been several articles in the papers lately making some mystery as to the production of a pure brown loaf. We find no mystery about it. We take the native wheat, dress it to free it from its natural dross in the shape of seeds, dirt, etc., put it through a grinding mill (not a flour mill) making a comparatively fine meal of it, blending two or three sorts of wheat in the process, and we find that we can make an excellent brown loaf. We also find that we can, if necessary, incorporate 15 per cent. of barley flour, which, if anything, improves the flavour. This might be useful to the country at some future date, if not at the present time. In the articles we have mentioned, appearing in the medical journals and elsewhere, the impression given is that it requires a lot of ingenuity and possibly special machinery to make a wholemeal flour from natural wheat, but we do not find this to be the case." The foregoing is an abstract of a communication from Mr. Ernest A. Fuller, chairman and managing director of the English Grains Co., Ltd.

* * *

Vitamin B_1 in White Bread

We are informed that wheat germ is added to the food marketed under the trade name of Em-Prote. This is interesting in view of the Government's decision to incorporate vitamin B_1 into white bread. We understand that the product mentioned is used particularly in vegetarian and invalid diets, and is made by Eustace Miles Foods Company.

* * *

Yeasts

Claiming that there is a grade of yeast suitable to every kind of dough aerating process, British Fermentation Products, Ltd., have evolved several modifications which they market under different names. Their illustrated booklet describes these fully.

* * *

Rice Conversion

Dr. Aykroyd, in conjunction with Research Institutes, is recommending that losses during washing and cooking of parboiled rice should be counteracted by propaganda. The reason for this is that washing before cooking eliminates most of the vitamin contents of parboiled rice, because they are steeped only superficially into the surface layers of the grains. However, educational efforts in that respect necessitate the change of habits of generations, and such changes, especially with Far Eastern populations, are exceedingly difficult and time-taking to bring about The adoption of "Rice Conversion" eliminates any necessity for such efforts, because the "conversion" of rice provides complete and uniform penetration of the entire endosperm of the rice with the vitamin and, whilst washing before cooking may eliminate a very small percentage of the vitamins in the surface layers, the bulk of the vitamin content of each grain will remain in the rice even after intensive washing and also after cooking with an excess of water.

Thus, the idea of converted rice is to supply a rice which is as rich in vitamins and minerals as the unmilled rice (Loonzain), but does not possess those qualities of parboiled rice which, to the consumer in Western countries and also to a large percentage of Far Eastern consumers, detract from its value in respect of appearance, smell and flavour.

A detailed account of the H. R. Rice Conversion Process is issued in the form of a booklet and six appendices, by Rice Conversion, Ltd.

* * *

Dietary Service

A booklet in compact form, in which the pages are perforated for withdrawing and handing to patients by their medical advisers, has been issued by Energen Foods Co., Ltd. The pages contain nutritional indications and specimen menus for various disorders. Other publications by the same company include the Energen Book and *Food Values*. All these booklets are free on request and should be of interest to all practising dietitians.

* * *

Use of Emulsions in Baking

Under present conditions any methods which prove a saving in oils and fats are to be welcomed. Plain oil, such as cottonseed oil, nut oil, etc., or compound fats, are used extensively by the baker for a variety of purposes, but if these are made into batching-oil emulsions, nut-oil emulsions, etc., the finished products are improved, and this saving in oil is very important in these times of restricted supplies.

The oil in the emulsion is more evenly distributed throughout the dough, resulting in improved texture with less oil, and the goods retain their moisture and keep soft longer.

Tin-greasing oils are expensive and the waste is considerable. Half the oil made into an emulsion is quite as effective for this purpose, and much cheaper.

The Hunter Machines Co., Ltd., claim that their "Hunter Emulsor" has proved exceptionally suited for this type of emulsion, as it produces a perfectly stable one. They state that it is being used by large factories and by wholesale manufacturers, who supply the emulsions to the smaller firms in suitable containers.

* * *

Baking Ovens

Some bakers, especially those connected with large-plant bakeries, prefer brick-built baking ovens to those of the portable type. The General Electric Co., Ltd., in conjunction with Melvin and Gillespie, Ltd., are constructing brick-built electric baking ovens, a number of installations of which are now in satisfactory operation.

The baking oven is designed to enable, among other things, ease and accuracy of heat control, low maintenance costs, combined with long life and uniformity of baking. The control on the smaller types is usually arranged for by means of a series of parallel switching on groups of elements, whereas in the larger ovens, and particularly those of the travelling type, automatic control for various sections of the oven is provided, which enables pre-determined temperatures to be maintained without the necessity of constant adjustment by the operator.

* * *

Recording Instruments

Reliable instruments are an indispensable adjunct to the control of the process of baking in the manufacture of confectionery. Plant can be equipped with instruments which give not only an instantaneous reading of conditions, but which also give on a twenty-four-hour chart a permanent record which assures both operator and management that the proper treatment conditions have been maintained throughout the whole process period.

The final and most recent development is that in which the recorder is combined with some controlling relay which relieves the operator of this responsibility, and in fact controls the process far more closely than is possible by manual operation.

Bristol's Instrument Co., Ltd., have an extensive range of such indicators and recorders for the measurement of temperature, pressure, flow, humidity, etc.

* * *

Glasgow Milling Students Gain Honours

At the recent examination of the City and Guilds of London Institute, Glasgow milling students gained the distinction of taking second place in Britain for the number of passes. Seven students, all employees of the Scottish Co-operative Wholesale Society's Regent Flour Mills, gained distinction.

The successful candidates were: A. J. Barrie, J. Johnston, J. Hastie, H. Warnock, A. Blacklock, D. Carswell, and J. A. Stewart.

* * *

Rapid Testing by Fluorescence

A large number of foodstuffs may be examined instantaneously by the fluorescence test, the principle being, as is well known to chemists, the property of ultra-violet rays of causing many substances to fluoresce in striking colours, the colour in each instance being characteristic of the composition. The results of the test must be taken in conjunction with other physical and chemical tests; the fluorescence test is not an absolute criterion of genuineness. It does, however, provide an instantaneous, visual, specific test of very wide application, and frequently gives in a few seconds a result that saves hours of elaborate and costly analysis.

A handbook entitled *Rapid Testing, applied to foods, chemicals, etc., in industrial and scientific research, by*

fluorescence with the Hanovia Analytic Lamp has just been issued by Hanovia, Ltd., and forms one of a series of brochures on practical applications of ultra-violet rays.

A full and up-to-date account of the subject is given, which will show the way clearly to those wishing to take up this fascinating method of examination of materials. This little book is obtainable at the nominal price of one shilling.

* * *

Sifting and Mixing

One important item in the manufacture of such products as cattle and infants' foods, spices, cocoa, pepper, mustard, cake flour, pudding powders, prepared foods, etc., is the efficient mixing and blending of the various dry ingredients.

The patent combined "Rapid" sifter and mixer, manufactured by Wm. Gardner and Sons (Gloucester), Ltd., is claimed to perform this operation satisfactorily. In addition, it will crush or reduce lumpy powders, such as tartaric acid, bicarbonate of soda, sulphate of magnesia, nitre, etc., and sift and thoroughly blend them with other ingredients in one operation. This machine is available in varying types and sizes, and of considerable interest to millers in blending flour improvers, wheat meals, etc., is size 1, which will blend about 50 sacks of flour per hour.

* * *

Moulded Pulp Containers

Manufactured as they are at a temperature of 600 to 700° F., moulded pulp containers have the advantage of being sterile. They are now being widely used for biscuit containers. The pressure of work entailed by the necessities of containers for other trades has not enabled Universal Pulp Containers, Ltd., to develop these articles for a large range of food products, but they maintain that moulded pulp containers are eminently suited for the packaging of flour confectionery from the points of view of adaptability, strength and hygiene.

* * *

Vacuum Drying of Foodstuffs

Rapid freezing, with subsequent storage at low temperatures, is probably the most effective way of preserving the desirable properties of foodstuffs. If, however, the moisture present in the frozen foodstuffs in the form of ice is removed by evaporation in a high vacuum, the desiccated products can be transported and stored without the need for refrigeration, and there is in addition a large saving of weight.

In view of these possibilities, a small-scale plant, designed to dry foodstuffs at low temperatures, has been in operation at the Low Temperature Research Station during the past year on behalf of the Food Investigation Board of the Department of Scientific and Industrial Research. Many different foods have been dried, such as fruit, vegetables, fruit-juices, meat, eggs, butter and milk, and it is now clear that the products obtained are in general superior to those obtained by other methods of drying.

British firms that are interested are invited to get into direct touch with the Superintendent, The Low Temperature Research Station, Downing Street, Cambridge (Telephone: Cambridge 4477), who will be glad to give them further information. Application has been made for a patent (British Patent Applications Nos. 617/39 and 3181/39).

* * *

Vacuum drying is widely employed for such materials as coffee and cocoa beans, tea, sugar, fruits, vegetables, gelatine, milk casein and a variety of other foodstuffs, and the advantages of drying by this method are numerous.

Realising the importance of an efficient drying apparatus to many industries, Francis Shaw and Co., Ltd., have designed several types of plant, all of which work *in vacuo*. These are obtainable in fifteen standard sizes and there is also available an experimental vacuum drying stove suitable for laboratory work.

Members of Food Industry in H.M. Forces

The Editor is always glad to receive news of members of the food industry who have joined H.M. Forces, so that their activities can be duly noted and published.

Fruit and Vegetable Drying

What is claimed to be an entirely new process for drying certain fruits and vegetables has been worked out by the Kestner Evaporator and Engineering Co., Ltd. The process involves whole fruit and vegetables, which after slicing to a suitable form can be dried whilst retaining their natural colour and flavour to a remarkable degree.

The treatment enables the fruit to retain its colour and prevents oxidation, which in the case of certain fruits, such as apples, rapidly destroys the natural colour. The manufacturers claim that the operating cost of this plant is extremely small and that large quantities of material can be handled in a relatively cheap plant.

The importance of the process under present conditions is that not only can it be used to solve the problem of surplus fruit and vegetables, but it also enables rations for the fighting forces to be made up with the inclusion of fruit and vegetables, which are essential to a balanced diet.

* * *

Drying Milk Powder and Similar Products

For many years twin cylinder drying machines have been used for producing food products such as milk powder, infant and dietetic foods, prepared cereals, chocolate, etc., but up till a few years ago the problem of drying cheese whey presented some difficulty. However, exhaustive research in the laboratories and creameries of Bertrams, Ltd., makers of the drying machine, has succeeded in locating the cause of the earlier difficulties, and by taking certain precautions it is now possible to produce without difficulty a high grade and edible commodity either from raw whey fed direct to the machine or from precondensed whey. It is understood that the final product is being used, to a very large extent, by bakers and confectioners for incorporation in their various products on account of its highly nutritious and dietetic value.

* * *

Fresh Vegetables for Institutions

The following circular has been sent by the Ministry of Health to County Councils, County Borough Councils, Mental Hospital Boards, Joint Boards and Visiting Committees, and other Local Authorities with hospitals in the Emergency Hospital Scheme, all other Local Authorities and Joint Hospital Boards, Voluntary Hospitals in the Emergency Hospital Scheme:

"I am directed by the Minister of Health to state that his attention has been drawn by the Minister of Food to the desirability of making the greatest possible use of the ample supplies of fresh vegetables which are available at the present season. Every possible step should be taken to ensure their consumption instead of tinned vegetables, in order to avoid any waste of valuable foodstuffs. I am therefore to request that immediate action should be taken to this end in all hospitals within the Emergency Hospital Scheme and in all other residential institutions under the control of Local Authorities, so that supplies of tinned vegetables may be reserved to meet any possible shortage at other seasons of the year."

* * *

Appointment

The Minister of Food has appointed Mr. H. W. Clements, Director of Wiltshire United Dairies, Ltd., to be Trade Adviser to the Ministry of Food for condensed milk, dried milk and cream.

* * *

Obituary

Mr. William Downie Flett, of James Flett, Sons and Company, fishcurers, of Buckie, died recently at the age of 83. He revolutionised herring curing, being the first to use the brinometer for testing the degrees of salinity in pickle. Before its introduction salinity was determined by seeing whether a potato floated or sank in pickle.

* * *

Robey and Co., Ltd.—Correction

In our issue of July 3, 1940, page xliii contained an advertisement of boilers, illustrating three Robey Economic Boilers supplied to the Bristol Co-operative Society, Ltd.

The manufacturers regret that, owing to changes in their staff due to the war, they omitted to state that these boilers were supplied through the Aluminium Plant and Vessel Co., Ltd., with whom they have frequently been associated on similar work in the past, and would like to draw the attention of readers to this omission, for which they have formally tendered their apologies to that company.

Confectioners' Benevolent Fund

It was owing to the drastic legislation and restrictions placed on the confectionery trade during the last war, that retail confectioners found it necessary to band together to prevent their trade being closed down entirely.

This caused so great an increase in the membership of the London and South of England Confectioners' Protection Society during 1916 that it was decided to start a Benevolent Fund. Subscriptions began to come in, and a scheme was prepared for the administration of the Fund. Its 22nd and 23rd Annual Reports and Balance Sheet has just been published, together with a lengthy list of subscribers from all parts of the country who have contributed to the Confectioners' Benevolent Fund.

* * *

Oil and Water Separation

With nearly every engineering firm engaged continuously upon work of national importance any delay through the breakdown of tools and equipment or loss of time due to spoiled work is obviously undesirable. Where compressed air mains are concerned excessive moisture in the supply lines results in rust and corrosion, washing away of lubrication and deterioration of packings in pneumatic tools, water hammer, spoilage of spray paintwork and damage to valves and meters, besides reducing the effective carrying capacities of the lines. The provision of efficient oil and water separation is therefore of supreme importance to all users of compressed air to-day. B.E.N. Patents, Ltd., claim to have found a solution to this problem with their new Oil and Water Separator and also their Automatic Drain Trap.

* * *

New Laboratory Apparatus

A booklet with the title *New Apparatus for the Laboratory* has been recently issued by A. Gallenkamp and Co., Ltd. For many years this firm has been active in offering to the chemist useful modifications of chemical apparatus devised to save time and increase accuracy.

Among some interesting items is the modified Conway Micro-Burette, described by Dr. E. J. Conway, Professor of Biochemistry, University College, Dublin, in his book *Micro-Diffusion Analysis and Volumetric Error*.

To those chemists interested in the historical aspect of laboratory apparatus the book *The Tools of the Chemist*, by Ernest Child, will appeal.

The Newton Electric Pointer is a handy instrument for the lecture-room, throwing a small but brilliant arrow-shaped image on the screen picture.

An advancement in British balance design is the Oertling No. 62 Aperiodic Prismatic-Reflecting Chemical Balance with "Multiweight" device, which, it is claimed, marks a new standard of speed and accuracy in precision weighing. The booklet shows other ingenious gadgets for the laboratory.

* * *

Flexible Couplings

The flexible coupling is now almost universally applied as a connecting link between driving and driven mechanisms. It performs several very important functions in any power transmitting system, and successful operation is, in many instances, dependent upon its efficiency. A flexible coupling should not be considered as a cure for the defects arising from bad workmanship in the erection and adjustment of tranmission equipment, but it should be regarded more as a corrective for unavoidable errors which inevitably occur in the most carefully erected plant.

From a theoretical point of view, it is essential that a driven machine should be isolated from all causes which may adversely affect its performance. This state of affairs, however, cannot be attained in practice, but the correct employment of an elastic coupling will protect both driving and driven machines from a number of causes affecting successful operation.

The Power Plant Co., Ltd., manufacture a complete range of all types of flexible couplings sufficient to cover any particular application. These are illustrated and described in their catalogue W.F. 271-277.

* * *

Black-out Ventilation

Essential adherence to the strict black-out regulations has resulted in certain difficulties in providing adequate ventilation. The primary results of inadequate ventilation are lowered vitality and predisposition to disease.

Some proper means of ventilation is essential in every work place; it is a vital factor of health and has been established as a necessity for true efficiency in factories or offices.

One way of overcoming the problem is suggested by Colt Ventilation, Ltd., who have designed a black-out ventilator for the purpose of freely admitting air into or out of a room or building without at the same time allowing the passage of light in either direction, or, in the official phrase, procuring "ventilation with light obscuration."

* * *

Generating Set

It is a well-known fact that power can be produced very economically from process steam by passing this through a back-pressure steam engine before utilising the steam in the works, and, where all the steam so exhausted can be absorbed, this is perhaps the cheapest possible method of developing power. There are obviously certain cases where only steam for process work is required, and in these instances a high-speed, back-pressure steam engine will be found useful, as the load developed by the set is determined by the demand for process steam in the works at any particular moment.

To meet any variations in the process steam demands, a control gear is designed and fitted which avoids the engine exhausting more steam than can be absorbed in the works. This special regulating gear, requiring no outside supply of pressure, water or oil for its operation, controls the steam admitted to the engine and consequently the load and the amount of steam exhausted to the process mains. A slight drop in the pressure in the main due to an increased demand for process steam will instantly operate the regulator and admit more steam to the engine and *vice versa*.

This set was supplied to a firm in the west by Ashworth and Parker, Ltd.

* * *

Low Temperature Insulation

Many industries, particularly those in which perishable foodstuffs are processed or stored for sale, require the help of cold storage, especially during the summer.

Refrigeration depends upon two factors: the use of a device for producing low temperatures, such as a refrigerating machine, and a closed room, compartment, or refrigerator lined with an insulation of low conductivity so that the refrigerating medium may extract heat from the enclosed compartment at a much faster rate than the outside heat can force its way through the walls of the enclosure.

The first requirement of a cold storage insulation is that it should have a high insulating efficiency. The material must also have the proper structural qualities, must be resistant to damage and abuse and must be readily applied. Of perhaps even greater importance is the necessity of protection against water vapour and moisture. One essential character of all commercial insulating materials is that they contain millions of air voids or interstices.

The importance of these conditions has been realised by the Celotex Company who, after many years of research, have developed an efficient sealed insulation adapted to the severe requirements of the cold storage industry.

* * *

New Appointments

The Welsh Plate and Sheet Manufacturers' Association have recently made some new appointments. Capt. H. Leighton Davies is chairman of the Association; vice-chairmen, Major J. M. Bevan and T. O. Lewis; secretary, P. O. Williams; and assistant secretary, L. D. Matthews.

* * *

New Branch Office

Standard Telephones and Cables, Ltd., announce that they have opened a Branch Office at Temple Courts, Temple Row, Birmingham 2, which will be under the management of their local representative, Mr. J. Gilmour.

INFORMATION AND ADVICE

Vitamin B_1 Determination—Christmas Pudding—Pectin Manufacture—Tomato Sauce—Information Supplied

Vitamin B_1 Determination

6,467. *We have noticed a reference to the fact that there is now available a volumetric method for the determination of vitamin B_1 in food products, but on making enquiry we cannot obtain any particulars of this method.*

We would like to be able to determine the Vitamin B_1 content of fresh compressed yeast and dried compressed yeast. Perhaps you can give us the information we need or put us in touch with the right source of information.

The following is an extract from the letter of a well-known expert on the subject, which we hope will be of some assistance to you.

References to modifications of Jansen's thiochrome method of determining vitamin B_1.

1. Magnus Pike, "The Distribution of Vitamin B_1 in Foods as Determined by Chemical Analysis," *J. Soc. Chem Ind.*, **58**, 338, 1939.

2. D. J. Hennessy and L. R. Cerecedo, "The Determination of Free and Phosphorylated Thiamin by a Modified Thiochrome Assay," *Jour. Amer. Chem. Soc.*, **61**, 179, 1939.

Only the latter paper gives values obtained on yeasts.

These are not volumetric methods; they use the fluorescence in ultra-violet light of the thiochrome of vitamin B_1.

Kinnersley and Peters' Method is colorimetric, and it is questionable whether it is applicable to dried yeasts.

Christmas Pudding

6,540. *I should be obliged if you could give me one or two practical recipes for the manufacture of Christmas puddings—one for the best quality and another of a more economic type, suitable for war-time production.*

It is, of course, more satisfactory for a manufacturer to evolve recipes in accordance with his estimate of the market, but this will give you a basis for experiment:

CHRISTMAS PUDDING, FANCY GRADE

20 lb. currants.
20 lb. seeded muscatel raisins.
20 lb. suet.
15 lb. breadcrumbs.
5 lb. sugar.
2 lb. candied peel, lemon.
5 lb. candied peel, orange.
5 lb. flour.
¼ lb. powdered nutmegs.
8 doz. eggs.
6 gal. brandy.

CHRISTMAS PUDDING

20 lb. suet.
20 lb. currants.
16 lb. flour.
10 lb. breadcrumbs.
20 pints molasses.
5 oz. tartaric acid.
20 pints apple pulp.
½ lb. salt.
4 oz. ground Saigon cinnamon.
4 oz. baking soda.

Packing into cans, seal and process as follows:

¼ lb. cans	...	...	1½ hours	at 240° F.
½ lb. ,,	...	...	2 ,,	
1 lb. ,,	...	...	2½ ,,	
2 lb. ,,	...	...	3 ,,	
4 lb. ,,	...	...	4 ,,	

The mix should be weighed into the cans, covered with greaseproof paper and passed to the steamer—a chamber in which a temperature of 212° F. can be maintained for one to two hours. This steaming process is necessary before clinching the heads to prevent undue strain on the seams and the melting of the sealing compound. Steps should be taken to prevent water of condensation drifting on to the puddings, and the chamber should be at a high temperature before they are put inside. The cans should be passed to the seamer for closing as soon as possible after leaving the steamer.

For packing in other types of containers the mix should be weighed on to greaseproof paper, folded double, slightly damp, and dusted with flour. The corners should be tied with thread, and cooking carried out in a steamer or boiler. After cooking, the puddings should be hung to dry, then packed as desired.

Pectin Manufacture

6,428. *I have been asked to find out how to make pectin, and it has occurred to me that you might be able to help, or at least put me in touch with somebody who could.*

This, of course, requires at least the aid of a trained chemist. I think the best thing for you to do would be to obtain the services of an expert, who would show you how to do it and how to use it.

The name of an expert was given.

Tomato Sauce

6,490. *We should be obliged if you could supply us with a recipe for tomato sauce.*

TOMATO SAUCE

Tomato pulp, s.g. 1·022	120 gal.
Sugar	70 lb.
Salt	13 ,,
Vinegar, 100-grain	5 gal.
Onions, ground	13 lb.
Cinnamon, broken and sifted ...	2 ,,
Cloves, headless	1 ,,
Paprika	1 ,,
Powdered mustard	2 oz.
Cayenne pepper	1½ ,,

This will be found to cook to a finish of 55 gallons.

After cooking to a proper density, the mix should be passed through a screen 0·027-inch or 0·033-inch diameter to remove tomato fibre and other foreign bodies. To obtain a stable product it is advisable to pass the sauce through a homogeniser, which will break it down to fine particles and prevent separation.

Information Supplied

6,472. *We should be glad if you would furnish us with the names of suppliers of Filtragol (pectolytic enzymes).*

Name of firm given.

6,470. *We shall be glad if you will kindly let us have the names of manufacturers of acid-resisting plant. We are particularly interested in protecting metal in a concentration of sulphuric acid fumes—1 in 50,000.*

Names and addresses of various suppliers given.

6,482. *I should like the name of a firm who supply second-hand wrapping and labelling machines, in this case for use on salmon tins and cans.*

Names of firms supplied.

6,513. *In your issue of February 2 you published an article on Starches and Potato Flour.*

We shall be glad to hear if you have any information as to the manufacture of machinery for processing potatoes into flour or into stock-feed. Also any other information such as market price or whether the goods are controlled in any way.

The enquirer was put in touch with a source of information regarding the manufacture of machinery for processing potatoes, and other details.

6,476. *We should be glad if you would give us some information regarding suppliers of hand fillers for vinegaring pickles.*

Names of suppliers given.

RECENT PATENTS

These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents", and are published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

Abstracts of Recent Specifications

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, either sheet by sheet as issued on payment of a subscription of 5s. per Group Volume, or in bound volumes price 2s. each.

New or improved process for the production of Food Powders

This invention has for its object to produce a food powder which, by the simple addition of water, milk, or the like liquid, and sugar, shall be ready for table use, and consists of a process of manufacturing a food powder, consisting in mixing corn flour, potato flour, rice flour, arrowroot, or a blend of one or more of such substances with water to a paste-like consistency, cooking the mixture until its starch gelatinises, thinning the mixture with cold water and straining and spray-drying the product.

A modified process of manufacturing the food powder, in which a liquid flavouring is added to the thinned mixture prior to the straining and spray-drying operations.

A modified process of manufacturing the food powder, in which the said mixture, which has been cooked until its starch has gelatinised, is spray-dried, finely ground, and a flavouring in powder form added.

518,237. H. Schmidt and Atomised Food Products, Ltd.

Improvements in or Relating to Methods and Apparatus for the Manufacture of Special Bakers' Flours

Bakers' flours, more particularly white flour, have the bran and germ removed therefrom in the course of manufacture. Both the bran and the germ contain small proportions of the anti-neuritic vitamin B_1 (aneurin) and many proposals have been made for the restoration to flour of the aneurin in proper proportions. By the term "aneurin" as used in this specification is meant the physiologically active anti-neuritic substance, vitamin B_1 hydrochloride or other salt of the base.

The object of the invention is to provide methods and apparatus for producing special bakers' flours one characteristic of which will be that they contain aneurin in the form and proportion most suited to the physiological requirements of the human body. Another object of this invention is to incorporate chemically pure aneurin in flour so as to make a completely homogeneous composition.

According to the present invention there is provided a method for the manufacture of special bakers' flour which includes the steps of preparing a concentrate consisting of a solid dispersion of aneurin in an absorbate of flour, of starch, of other carbohydrate as hereinafter defined or of other powder which in the amount present in the final flour is non-injurious to health or to the baking properties of the flour, and bringing together and intimately incorporating the aneurin-containing concentrate with a relatively large bulk of flour, the conditions under which the concentrate is formed and incorporated in the flour being controlled so that the temperature of the aneurin-containing material at no stage exceeds 100° C.

The method may include the steps of (*a*) preparing a solution or suspension of aneurin (*b*) spraying or otherwise intimately mixing the aneurin-containing solution or suspension with a solid absorbate of flour or of starch or other carbohydrate to form a dry powder having a moisture content not exceeding or not substantially exceeding 12 per cent., (*c*) introducing the aneurin-containing powder into a flour mill in admixture with flour, and (*d*) dressing the mixture, the process being carried out without allowing the temperature of the materials at any stage to exceed 100° C. The intimate admixture of the aneurin-containing solution or suspension with flour or with starch or other carbohydrate may be followed by the step of drying the mixture to produce a freely-flowing powder.

The invention further includes a method for the manufacture of special bakers' flour which comprises the steps of (*a*) preparing a liquid suspension, sol or gel of flour or of starch or other carbohydrate, (*b*) precipitating aneurin from a solution or colloidal suspension thereof into such suspension, sol or gel, of flour or of starch or other carbohydrate, (*c*) concentrating and rapidly drying the material to solid pulverulent form having a moisture content not exceeding or not substantially exceeding 12 per cent., (*d*) introducing the powder into a flour mill in admixture with flour, and (*e*) dressing the mixture, the steps of the method being carried out without allowing the temperature of the aneurin-containing materials at any stage to exceed 100° C.

The suspension, sol or gel of flour or of starch or other carbohydrate containing the aneurin may be submitted to vigorous agitation in order to ensure the intimate association of the ingredients prior to concentrating and drying; and this agitation may be effected, *e.g.*, by passing the suspension, sol or gel through an emulsifier or colloid mill.

The concentration and drying of the aneurin-containing suspension, sol or gel may include the step of submitting the liquid to centrifuging and in one preferred form of the invention the liquid discharged from the centrifuge may be employed for the preparation of a further liquid suspension, or sol or gel of flour or of starch or other carbohydrate. Alternatively, the aneurin-containing suspension may be dried without centrifuging.

The aneurin may be derived from a naturally-occurring product or may be produced synthetically. It may conveniently be employed in the form of the hydrochloride or the phosphate.

This invention includes a method of producing white flours and other endosperm products of cereals having a high potency in respect of aneurin without resorting to the direct use of those portions of wheat or other natural sources of the vitamin which might produce a detrimental change in the outward appearance, taste, baking qualities, or general character of the white flour, or of the other endosperm products in which chemically pure aneurin is uniformly admixed with white wheaten or other cereal flour or with cereal endosperm products, under such conditions as to ensure its uniform distribution and absorption. It is characteristic of this invention that the aneurin is in the first place uniformly incorporated in an adsorbate which may consist of a portion of the flour itself or may consist of a preparation made from flour or from starch or other carbohydrate or again may consist of another powder as above mentioned.

522,418. Albert Green.

Improvements in or relating to Sausage and like Casings

The manufacture of sausage or like casings from strips of paper or like material, and includes the method of making the same and apparatus for performing the necessary operations. The casing referred to herein is formed from strips by sewing the edges together to make tubing, and comprises two strips, one of which forms an inner flap or seal for the longitudinal seam, as will be more particularly described hereinafter.

The objects of this invention are to provide an improved machine or apparatus for making tubular casings from paper or the like; to provide means for folding one or more strips of paper and sewing the same along the edges; to provide means for folding two strips of paper together with their edges in overlapping relation and sewing the same along such edges to provide a tube or casing with an inner seal or welt; to provide means for interfolding two strips of material and sewing the combined edges thereof to make a casing and to modify or change the shape of the casing after being sewn, whereby it will be in proper form for use; and to provide improvements in the apparatus and parts thereof, and also the method and product, as will appear more fully hereinafter.

A method is described of forming a sausage or like casing, including the steps of folding two strips of paper or like material, one of which is narrower than the other, longitudinally with the narrower strip embraced by the wider strip and with their edges lying together and then fastening said edges together.

There is also comprised an apparatus for making sausage or like casings by the method set forth above, which includes a folding mechanism comprising two co-acting folding members through which the strips are passed, the folding members being shaped to fold one strip within the other with the edges of the strips in overlying reaction, and means for moving the strips through said folding mechanism.

The invention also includes a sausage or like casing produced by the method set forth above and comprising a strip having its edges brought together, and a second strip folded to form a tube and having its edges positioned between the edges of the first-named strip with means for fastening the edges together.

520,314. Francis Heron Rogers for The Name Corporation.

Improvements in or relating to processes for Treating Naturally occurring Starchy Materials in order to Saccharify them

Processes for treating naturally occurring starchy materials in order to saccharify them.

The process of saccharifying naturally occurring starchy materials according to the present invention consists essentially in removing substantially all the water-soluble mineral matter from the naturally occurring starchy material by counter current washing such as takes place in maceration or diffusion batteries, and then subjecting the starchy material to the action of a *p*H value lower than is customary in the acid hydrolysis of starch, by means of an acid hydrolysing agent.

The washing operation may be effected with pure water or with a solution of the reagent which ultimately serves for the saccharification of the starch. This latter practice has the advantage of submitting to the hydrolysing action a mass penetrated throughout by the same reagent, which penetration is easily obtained by means of prolonged contact at moderate temperature such as takes place during the washing treatment of the present invention. The starch being practically insoluble in water, as well as in the dilute solutions of the reagents used as a moderate temperature, there is no fear of a large part being removed from the subsequent saccharification as a result of the duration of the demineralisation operation.

Mineral acids such as hydrochloric or sulphuric acids are preferred as the conversion agents of the present invention, but it will be appreciated that any other conversion agents, such as bisulphates, may be used.

519,268. Les Usines de Melle (Assignees of Firmin Boinot).

Improvements in or relating to the Treatment of Meat for Human Consumption

The invention has for its object to effect a pre-digestion of meat to render the latter more tender, wholesome and palatable, and, with this object in view, the invention contemplates the treatment of meat with the enzyme papain (papayotin).

It is, of course, well known that papain (papayotin), which is extracted from the leaves of the pawpaw tree (*Carica papaya*), is an active enzyme having properties similar to those of trypsin, one of the pancreatic enzymes which is most active in the presence of alkalies, and decomposes many albuminous bodies down to the stage of polypeptides. Papain has been used heretofore, either alone or in combination with other compounds, as a bread improver, the papain acting on the dough batch as a gluten-softening agent. Further, it is known that papain by itself will digest two or three times its own weight of blood fibrin.

Papain (papayotin) in powder form is mixed with an edible farinaceous material and the mixture thereafter sprinkled in powder form over the meat to be treated.

If the mixture is sprinkled over raw meat, the latter is then allowed to stand until the required extent of pre-digestion has been reached, whereafter it is cooked. The mixture may also be used upon cooked meat.

By mixing the powdered papain with the farinaceous material, such as wheat-flour, substantially in the proportion of 25 per cent. to 33⅓ per cent. by weight of the papain, the papain will digest approximately 150 times its weight of blood fibrin in a matter of a few hours.

In carrying the invention into effect pure papain in powder form is mixed with wheat flour in the proportion of 25 per cent. to 33⅓ per cent. by weight of the papain. If it is desired to use the juice of the pawpaw leaves, then all moisture should be evaporated therefrom and the resulting powder mixed with wheat flour in the proportion of 75 per cent. of said powder to 25 per cent. of flour by weight. The mixture is sprinkled over the raw meat, which is allowed to stand until the required extent of pre-digestion is reached.

The pre-digestive action on meat of the preparation is to make it tender, more wholesome and palatable, and in addition it breaks down the fibrous tissues which are normally not easily digested. In a case where it is desired to use the papain and flour mixture on tough meat subsequent to cooking, the meat, while still warm after being served at table, is sprinkled with the mixture and put away. When next served the meat will be found to be tender.

516,917. William Richard Flodden Lunt.

Complete Specifications Accepted

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

519,869. GEHLE, H.: Method for the production of uniform milling products.

519,926. HUZENLAUB, E. G., and ROGERS, J. H.: Production of cereal foods. (Cognate application 8445/39.)

520,085. BAADER, R.: Machines for sorting fish according to size.

520,104. MARSHALL'S TEA MACHINERY CO., LTD., and THORPE, T. S.: Tea-leaf rolling machines.

520,064. SHROFF, R. D.: Multiple-effect evaporation processes and apparatus for juices and other liquids.

Latest Patent Applications

3155. HUTCHESON, W. W., and MASON, W. C.: Cooking and drying potatoes, herbs, etc. Feb. 19.

3264. KINGS PATENT AGENCY, LTD. (PEARSON): Preparation of syrup for use in pineapple canning.

3268. KLEIJN, A.: Process for killing insect pests, etc., in food, etc. Feb. 21.

6808. FRIEDRICH, C. N. J. H., and BUNDHEIM, E. I.: Fish-boning machine. April 15.

6690. MUNN, D. S.: Process for preservation of fruit, etc. April 17.

9398. RODGERS, F.: Homogenising machines. May 28.

9328. MCDOWELL, R. H., and BULMER AND CO., LTD., H. P.: Hydrolysis of pectin. May 27.

9270. BRAUNSTEIN, M.: Production of an artificial sweetening material. May 27.

9140. HELLER, B.: Method of preserving meat. May 23.

9134. LAWTON, G.: Conching of chocolate. May 23.

8848. ALCOCK, A. U.: Apparatus for the electrical thawing of frozen meat. May 17.

8731. SMEDLEY BROS., LTD., and SMEDLEY, D. A.: Mixing machines or mills. May 16.

8269. BRANSCOMBE, D. J., SLADE, R. E., and IMPERIAL CHEMICAL INDUSTRIES, LTD.: Process for the manufacture of food. May 8.

8132. HARVEY AND CO., LTD.: Method and apparatus for treating comestibles. May 5.

TRADE MARKS

This list of trade marks of interest to readers has been selected from the "Official Trade Marks Journal" and is published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

APEX.—611,972. Flours and starches obtained from potatoes, rice, tapioca and sago, all for use as ingredients in food. **Robert Pintus and Co., Ltd.,** 5, Water Lane, London, E.C. 3. August 7.

CAMFRERE.—612,158. Dairy produce. **Louis Gustave Strauss,** Wetherden Hall, Wetherden, Stowmarket, East Suffolk. August 7.

CARACRISP.—612,175. Malt. **John Crisp and Son, Ltd.,** Station Road, Beccles, Suffolk. August 7.

CAVIETTE.—610,869. Prepared fish roe in paste form. **The Shields Ice and Cold Storage Co., Ltd.,** The Shields Preserving Works, Fish Quay, North Shields. (By Consent.) March 29.

COULOM.—612,157. Dairy produce. **Louis Gustave Strauss,** Wetherden Hall, Wetherden, Stowmarket, East Suffolk. August 7.

HONIVITE.—611,743. Biscuits containing honey (none being for animals). **Bee Bee Biscuits, Ltd.,** Sunya House, Scrubs Lane, Willesden, London, N.W. 10. July 10.

JENNIL.—611,380. Meat, dead poultry, dead game, meat extracts, preserved, dried and cooked fruit and vegetables. **Simon Blumenthal,** 9, Gloucester Drive, London, N. 4. (By Consent.) July 10.

NEW COMPANIES

Fat Improving and Preserving Processes Limited. (362330.) £500 in 10s. shs. Subs.: F. M. Picker, 7, Roland Gardens, S.W. 7; L. Geiger, 29, Templers Avenue, N.W. 11.

Sweetening Limited. (362256.) 99, Fetter Lane, E.C. 4. To take over the rights in an invention entitled "Process for enhancing the sweetening power of sugar and the treated sugar", mnfrs. of sweetened sugar treated by the said process, etc. £12 in £1 shs. Dirs.: E. L. Mendel, 147, Great Portland Street, W. 1; A. B. Bauer, 99, Fetter Lane, E.C. 4; M. W. Carmel, 99, Fetter Lane, E.C. 4; F. L. Heathorn, Woodberry, Valley Road, Rickmansworth.

Cambridge Cold Storage Company Limited. (362327.) Cap.: £20,000. Dirs.: W. B. Chivers, S. C. Chivers, R. Ducas, and J. Cresswell. Subs.: C. F. Butler, 221, Brampton Road, Bexleyheath; H. R. Curtis, 107, Somerset Road, Southall, Middlesex.

Brown and Harrison's Dairies Limited. (362355.) To take over the businesses cd. on by E. Harrison's Model Dairies, Ltd., and Alfred Brown, Ltd. Nom. cap.: £225,000. Subs.: H. Reynolds and H. A. Southwell, 7, Arundel Street, W.C. 2.

Doris Perkins Limited. (362222.) 32, Montagu Street, Kettering. Pastrycooks, etc. Cap.: £1,000. Dirs.: Mrs. D. W. Wright, 136, Rockingham Road, Kettering (permt. mang. dir.); Mrs. M. K. King, 32, Montagu Street, Kettering.

Taken from the Daily Register, compiled by Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C. 2.